

CIO

enterprise

Section Two • April 15, 1998

How to Climb Out of a Hole

**We all make
mistakes. But
not everyone
can recover
their balance.**

Page 30

Also Inside
**Not Invented Here:
When Does It
Make Sense
To Outsource R&D?**

Page 44

CIO David Anderson (standing)
and VP of Advanced Systems Chuck Eklund
kept their heads when an ambitious IT
project threatened to go over the edge.

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How to Cut Costs Out of

FYI

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Attached is a copy of **CIO Enterprise**. The articles take a cross-functional look at leveraging information technology to add enterprise value. Thought you might be interested...

TO: _____

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PAGE 8

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Their customers are changing.

Their competitors are changing.

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enterprise

VOL. 11 • NO. 13 • APRIL 15, 1998 • 154 PAGES IN 2 SECTIONS
SECTION 2

Features

30 If At First You Don't Succeed

COVER STORY: CHANGE MANAGEMENT If your big-ticket technology project fails, you could be fired—or given another chance. Find out how one project leader turned fiasco into success through equal parts humility and determination. *By Carol Hildebrand*

44 Outside Inspiration

RESEARCH AND DEVELOPMENT Outsourcing R&D projects can help research organizations address the challenges of faster cycle times, changing technology and skills shortages. But before you decide to buy your brainpower, you'd better be aware of the pitfalls. *By Lauren Gibbons Paul*

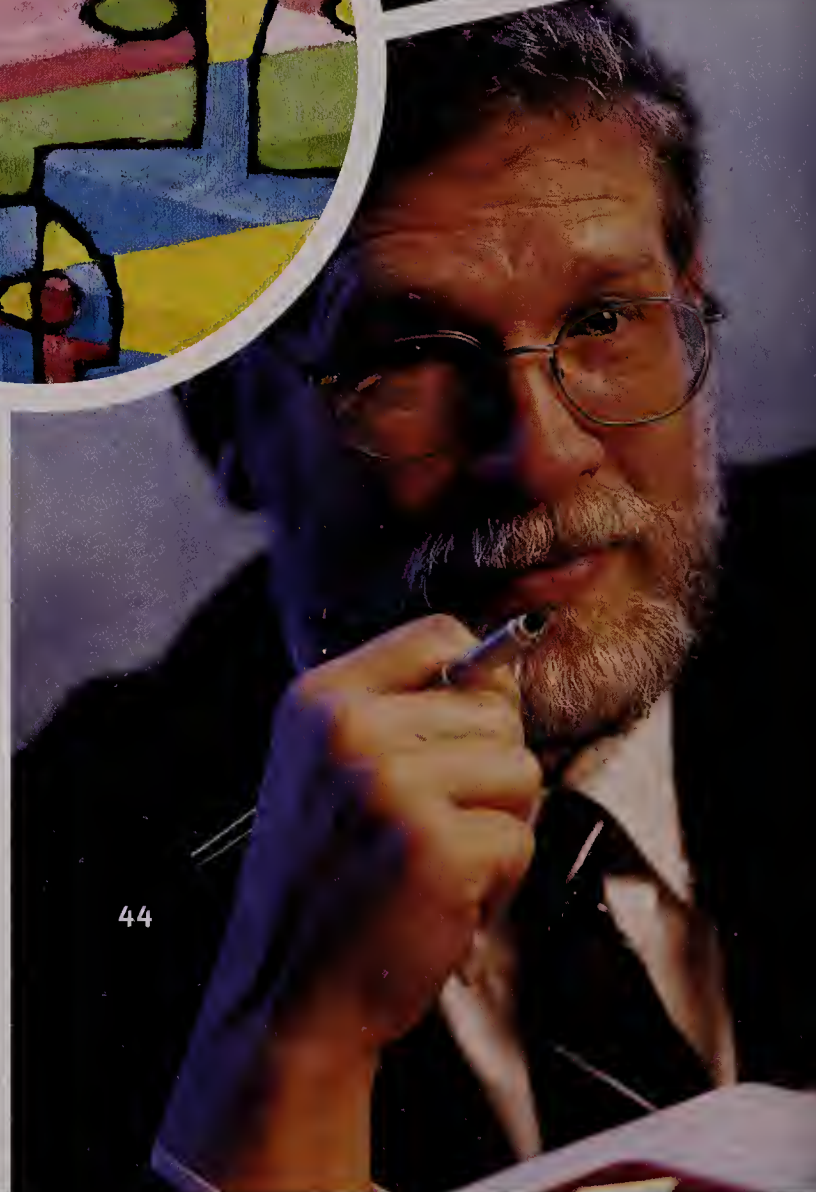
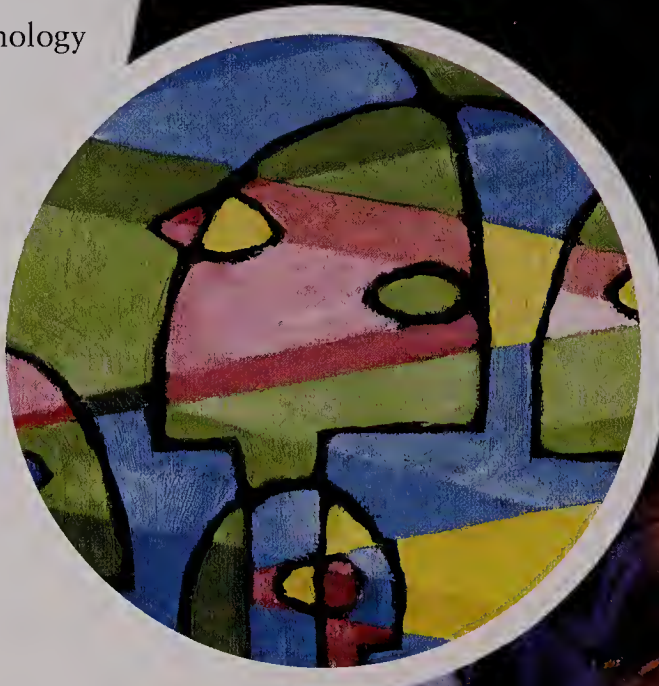
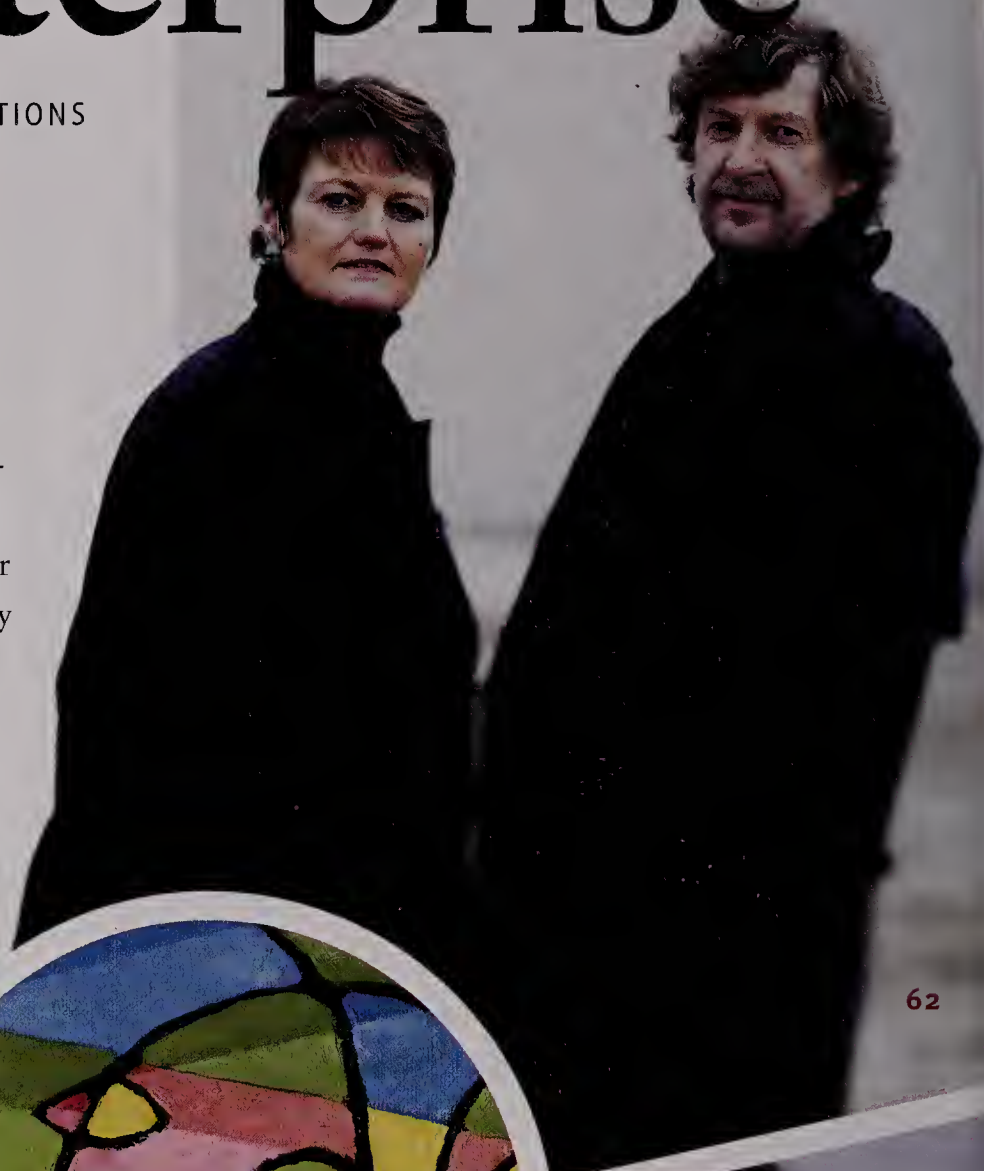
54 New Money

INTERNATIONAL BUSINESS If you thought the year 2000 problem was your only IT worry, think again. A new currency brought to you by a unionized Europe may very well rock the business world and your company's IT systems. *By Lynda Radosevich*

62 Simple, Yet Complex

BUSINESS MANAGEMENT Supporters of complexity theory believe that the secret to a more creative and productive workforce lies in some simple rules of nature. *By Megan Santosus*

ON THE COVER: A potential project disaster didn't stop Kaman Sciences' Chuck Eklund and David Anderson from turning a canyon of setbacks into a mountain of success. *Cover photo by Kent Hanson, illustration by Scott Matthews*



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Columns

22 Information Micromanagement

REALITY BYTES Our new obsession with tracking corporate knowledge purports to save money. Does it also stifle creativity? *By Megan Santosus*

26 Packaging Knowledge

INTELLECTUAL CAPITALISM Has your knowledge management system become a junkyard of unusable data? Make it useful with effective packaging. *By Paul S. Myers and Richard W. Swanborg Jr.*

68 Demystifying IT

CHECKS & BALANCES The IT Process Landscape can help clarify IT's value for those who pay the bills. *By Charles L. Gold*

74 Facts on Firewalls

LEARNING CURVE In this technological age, firewalls connote those safety frontiers that guard your invaluable corporate data. And your sanity. *By Suruchi Mohan*



26

Departments

6 Contributor's Page

10 In My Opinion

Letter from the publisher • New on our Web site • How to reach us

12 Plugged In

Chat Goes Corporate • C'mon Down! The Price Is Right...Sometimes • Rat Race Sluggishness • Gibberish Becomes Electra • *www.S-E-X.com* • Powdered Wigs and Power Macs • Meeting Me in St. Louis

72 Index

Enterprise Value Awards application follows Page 72.



Inside Section 1

COVER STORY: NETWORK

MANAGEMENT Will handing a stranger the keys to the company network keep you awake at night?

COMPANY PROFILE: FINGERHUT Good uses of a data warehouse can mean the difference between staying in business or Chapter 11.

PREPARING FOR CHANGE IN THE RESTAURANT INDUSTRY To edge out competitors for a healthier portion of the American food dollar, restaurants must cook up a fresh IT strategy.

EXECUTIVE COUNSEL When you transfer IS staffers as part of an outsourcing deal, make sure you supply them with precise information about the move.

GIGA VIEW The total economic benefits of an enterprise architecture initiative seem self-evident. But how to manage events to obtain every advantage for your company is not quite so obvious.

EMERGING TECHNOLOGY Biometrics move beyond Star Trek into reality.

WORKING SMART University of Central Florida has made the administrative aspects of academic life a lot easier.

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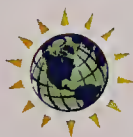
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Re: Power Play

TRACY KIDDER'S BOOK *HOUSE*, which traces the design and construction of a house from the architect's first pencil stroke to the owners' moving day, ends up being more about power and conflicting needs than hammering nails. There are three factions—the architect, the builders and the owners—and they all seek ascendancy of their own agendas. The architect wants the house to faithfully reflect his design, regardless of cost. The builders want to construct a solidly built structure, even if it means changing the design. And the owners want to get the most house from a limited budget. Naturally, the final product fulfills none of these goals to perfection.

I suspect that many technology projects fall prey to this same issue. You've got the users, who want a system that lets them do their jobs easily and efficiently. You've got the IS folks, addicted to elegant code and cutting-edge technology. And you've got the business executives, who are driven by bottom-line concerns. With all these voices directing the project, it's not surprising to find that many development efforts take two or three attempts to come to fruition. (See "If At First You Don't Succeed...", Page 30.)

Lately, it seems as though the user and executive corners of this triangle are becoming more influential or empowered. And many companies are discovering that empowered business people can choose the wrong technology just as anyone else can. I've spoken to several executives who rejected the technology chosen by a team of IS and user employees in favor of brand-name software. What's the justification? They want to make sure that the vendor

will be around to service it. And users also have been known to insist on technology that has more features than they really need—just because it's the latest thing.

In theory, the needs of the business should drive IT decisions. In fact, it usually boils down to whoever has the most power.

Carol J. Hildebrand

Carol Hildebrand, Senior Editor
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Companies are discovering that empowered business people can choose the wrong technology just as anyone else can.



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In My Opinion

I.T. UNEMPLOYMENT rates are at an all-time low—it's a seller's market for talent. How can CIOs ensure that their most valuable employees and contractors stick around? It's a critical question. In fact, plenty of research now suggests that employee and customer loyalty are more tightly bound than ever.

So what's the answer? David Ulrich, author of *Human Resource Champions: The Next Agenda for Adding Value and Delivering Results* (Harvard Business School Press, 1996), says companies

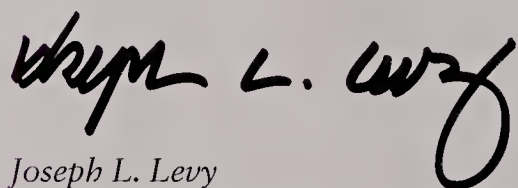
must "mass customize the employee relationship" if they intend to retain their top performers. Whereas many large companies have tried in recent years to standardize their employment contracts, Ulrich's research suggests that employees are far more likely to remain loyal if they are treated as individuals and their particular needs—for flexibility, responsibility and, of course, compensation—are addressed.

There are some interesting parallels between employee and customer.

Both want to be treated as individuals. Both want to have some measure of personal control over the development of products and services. And both want to be recognized for the particular contributions they make to a company.

The 21st century enterprise is one that understands the many facets of loyalty and knows how to address them all.

Is your company building individual, customized relationships with its employees? Have you discovered powerful ways to retain top talent? Please share your ideas and experiences with me on this subject.



Joseph L. Levy
President, CEO and Group Publisher
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Edited by Todd Datz

Plugged in

Retail
Technology 14

Technology and
Health 14

Speech
Software 18

Web
Monitoring 18

Law and IT 20

Meeting
Management 20

Customer Service

Chat Goes Corporate

GIVE AMERICA'S BUSINESSES CREDIT—few nonbusiness technology innovations slip by the corporate world unnoticed. Such is the case with the online chat room, something that most busy executives probably view as the domain of their teenage sons or daughters.

Chat rooms, for the uninitiated, are open-floor discussion areas on the Internet where anyone can type a short message about anything and get responses from one, two or a hundred people. While online chat has its devotees, until recently the term "purposeful chat" has been something of an oxymoron. Now, though, some businesses are starting to experiment with chat room technology as a medium for customer service. The advantages are cost savings (compared with traditional call centers) and cross-selling opportunities because customers can be routed to other online product information.

Although service-oriented chat is in its infancy, "It's very likely that it will take off," says **Kate**

Doyle, an analyst in Jupiter Communication LLC's Digital Commerce Group. "In 1998 you'll see a lot of experiments, but it's [only] a matter of time before it becomes commonplace." Doyle says complex products and services, as wide-ranging as travel arrangements and financial advice, are likely possibilities for chat-based customer service. Indeed, among the early users is financial giant Merrill Lynch & Co. Inc.

For chat technology to work reasonably in a customer service function, a customer has to be able to interact one on one with support personnel; standard open-floor chat is too chaotic. Also, security is a major concern for chat providers; business customers demand watertight security to prevent other Web surfers from listening in on sensitive conversations that might include confidential financial information. One software provider leading the way in handling those concerns is Business Evolution Inc. of Princeton, N.J. Business Evolution offers a secure product called Interact.Service and counts NASA and Los Alamos Labs among its customers. Interested parties can see how the service works by checking out the company's Web site at www.busessevolution.com.

—Derek Slater

Survey Says

1998's Ten Hottest Jobs

Estimated increase in the number of U.S. openings from 1997 to 1998

1. Brand Name CEO	300%
2. Chief Financial Officer (CFO)	227%
3. VP of Electronic Commerce	210%
4. Principal and Senior Manager of Consulting/Systems Integration	205%
5. Chief Information Officer	179%
6. VP of Development (Internet company)	163%
7. VP of Supply Chain Management	154%
8. VP of Outsourcing	133%
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10. CEO of IT Company	104%

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C'mon Down! The Price Is Right...Sometimes

IS INACCURATE SCANNER PRICING AT CHECKOUT COUNTERS a pervasive problem? If you've watched any of the alarmist news programs covering the topic recently, it's hard not to liken a trip to the grocery store to a 12-aisled con game.

Though that may be a slight exaggeration, inaccurate prices are more common than you think. "Under weights-and-measures standards in the United States, stores should be at 98 percent compliance [of pricing accuracy]. The reality is that no one is that compliant," says **Kevin Stadler**, president of Pricer/Intactix North America, a software company that offers products for the retail industry.

Stadler's company, which is based in Irving, Texas, is addressing pricing accuracy problems by introducing electronic shelf label (ESL) technology to eliminate discrepancies between shelf prices and register prices. Infrared receivers in the shelf labels and checkout counters are connected with the store's data system. When prices change—as they frequently do to accommodate promotions and sales—revised prices are routed through the entire store network, ensuring accuracy.

The benefits of such technology, which is being used in grocery stores, department stores and discount retailers like Wal-Mart Stores Inc., are twofold.

Customers get a sense of confidence that the prices are accurate. The stores cut down on the arduous process of constant price changing and can liberate more associates for customer service.

At Macy's in Monmouth Mall in Eatontown, N.J., ESLs are a retailer's dream come true. "We can make sure the prices on the goods are exactly what we planned them to be and that our associates are spending less time with signs and more time with customers," says

Marc Saffer, vice president of information systems for Macy's East.

Other companies offering ESL technology include Electronic Retailing Systems International Inc. and NCR Corp. Stadler says unequivocally that ESLs are here to stay: "It's not a question of if [all stores will be using ESLs]. It's a question of when."

—Meg Mitchell



Technology and Health

Rat Race Sluggishness

No one is recommending we jettison our cell phones just yet. But if you're someone whose workday includes frequent stretches of mobile phone conversation, you might welcome an earful of the latest research on that technology's potential hazards.



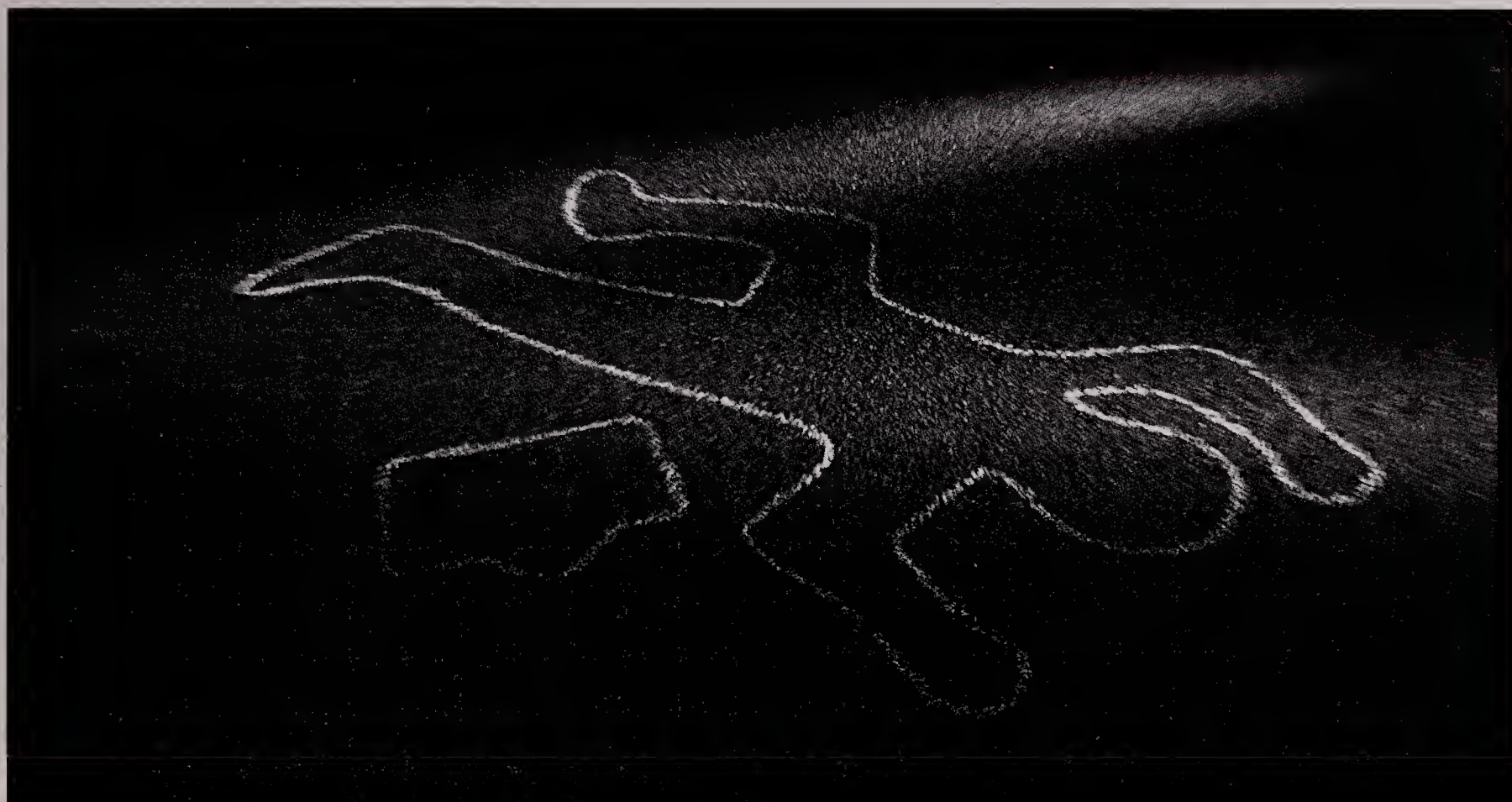
Last year **Henry Lai**, a bioengineering professor at the University of Washington in Seattle, reported that rats exposed to 45 minutes of a level of microwave radiation slightly

higher than what cell

phone users receive performed their lab tasks slower than unexposed rats. The DNA damage he found in the rats could eventually lead to slow onset diseases such as cancer and Alzheimer's disease, Lai says. A study completed in early 1998 at the VA Hospital in Loma Linda, Calif., confirmed Lai's findings. In that study, cancerous human cells exposed to low levels of cell phone radiation caused DNA changes in the cells.

A Finnish company, Hagenuk Telecom, has already begun marketing low-radiation cell phones. But Professor Lai and U.S. federal agencies caution against drawing clear conclusions about cell phone hazards until more data is available. The next steps, Lai says, are to experiment with a wide range of microwave frequencies, test for intermittent exposure to mimic real cell phone use and experiment with exposing only the rats' heads to better simulate human exposure.

In the meantime, we advise all cell phone users to drive at the speed limit and keep their eyes on the road. ■



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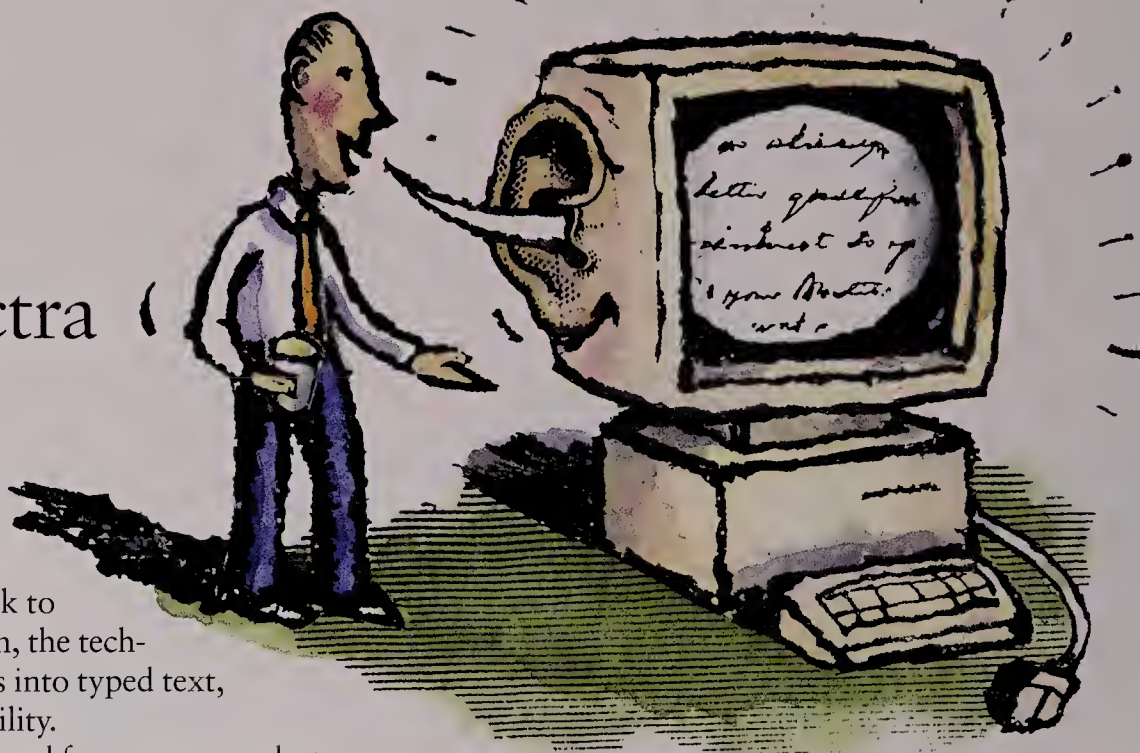
Plugged In

Speech Software

Gibberish Becomes Electra

FOR MOST OF US, TALKING to the computer means yelling at it when it crashes and loses a morning's work. Now there's a more productive reason to speak to your system. Speech recognition, the technology that turns spoken words into typed text, has reached a new level of usability.

The technology has been around for many years but only in a clunky way. Until recently, all PC-based speech recognition was of the "discrete" variety, which meant users had to speak in a stilted way with significant pauses between words. Before 1985, in fact, PCs required specialized hardware to achieve even that level of recognition. Recently two companies, Armonk, N.Y.-based IBM Corp. and Newton, Mass.-based Dragon Systems Inc., have released continuous speech recognition software pro-



grams that allow users to talk at normal conversational speed and have their words recorded as something other than an indecipherable string of gibberish. Proficient touch-typists may not gain terribly much from this, but two-finger "hunt and peck" practitioners will love NaturallySpeaking from Dragon Systems.

NaturallySpeaking does not work perfectly right out of the box. Users have to spend a little time "training"

the program to recognize their individual speech patterns.

More significantly, that means that only one person can use NaturallySpeaking on a particular PC; if the software has been trained to understand the boss, it will have trouble following the administrative assistant, for example. But these are relatively small quibbles now that the continuous speech hurdle has been cleared. As for future enhancements, the product manager for Naturally Speaking, **Laura Strassman**, says the product will be "better, cheaper, faster—this is the computer industry, right?"

Dragon Systems' product comes in three graduated levels of sophistication; the entry-level or personal package lists for around \$100. IBM offers a competitive product called ViaVoice for a similar price. Dragon Systems' high-end version jacks the price up to \$695 in return for a larger active vocabulary, better integration

Web Monitoring

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SO YOU THINK FURBISHER OVER IN COST AND EXPENSE HAS THAT GLEAM IN HIS EYE from spotting an error in the budget? And MacRibble is all aglow with excitement about the snappy memo he just sent to advertising?

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According to a survey from Cambridge, Mass.-based Elron Software Inc. (www.elronsoftware.com), nearly 70 percent of 100 responding companies found that their employees were accessing sexually explicit Web sites during working hours. Elron surveyed companies that were trying out its Elron Internet Manager software, which monitors employee Web surfing. Respondents monitored the sites their employees visited for at least three days and then submitted the actual usage reports to Elron, says **Kelly Haggerty**, product marketing manager at Elron. He says that the software can help companies put some teeth into written Internet usage policies. "It helps them enforce acceptable usage by giving [them] knowledge of what's actually going on."

At the risk of going out on a limb, we think there might be a lot of long faces around the water cooler. ■





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Plugged In

with common applications like Microsoft Office and a raft of power-user features. All three levels of NaturallySpeaking have a 230,000-word vocabulary, although that's a bit deceptive because only 30,000 to 55,000 words can be active at a given moment, depending on which version you're using. There are even customized versions for jargon-heavy professions such as law and medicine. Unfortunately Dragon Systems isn't promising an IT-specific version yet—that could be awhile, given the ERPs, SAPs and SFAs of the I-never-met-an-acronym-I-didn't-like IT industry. —Derek Slater

Law and IT

Powdered Wigs and Power Macs

JUST IN CASE READING LEGALESE ISN'T COMPLICATED ENOUGH, WITH ALL THOSE hereinafters and thitherto-fores, now lawyers have a chance to add a healthy dose of technical gibberish into the mix as well. The John Marshall Law School in Chicago is the first law school in the nation to offer a degree in information technology law. The master's program is available from the school's Center for Information Technology and Privacy Law. The curriculum includes courses in computer law, information policy and copyright law, and cyberspace law. "The world has grown increasingly dependent on computers and international communications systems," says center director and professor **George B. Trubow**. "Lawyers and policy makers need to be conversant in information technology law and policy."

For more information, cross-examine the school's Web site at www.jmls.edu/info/. ■

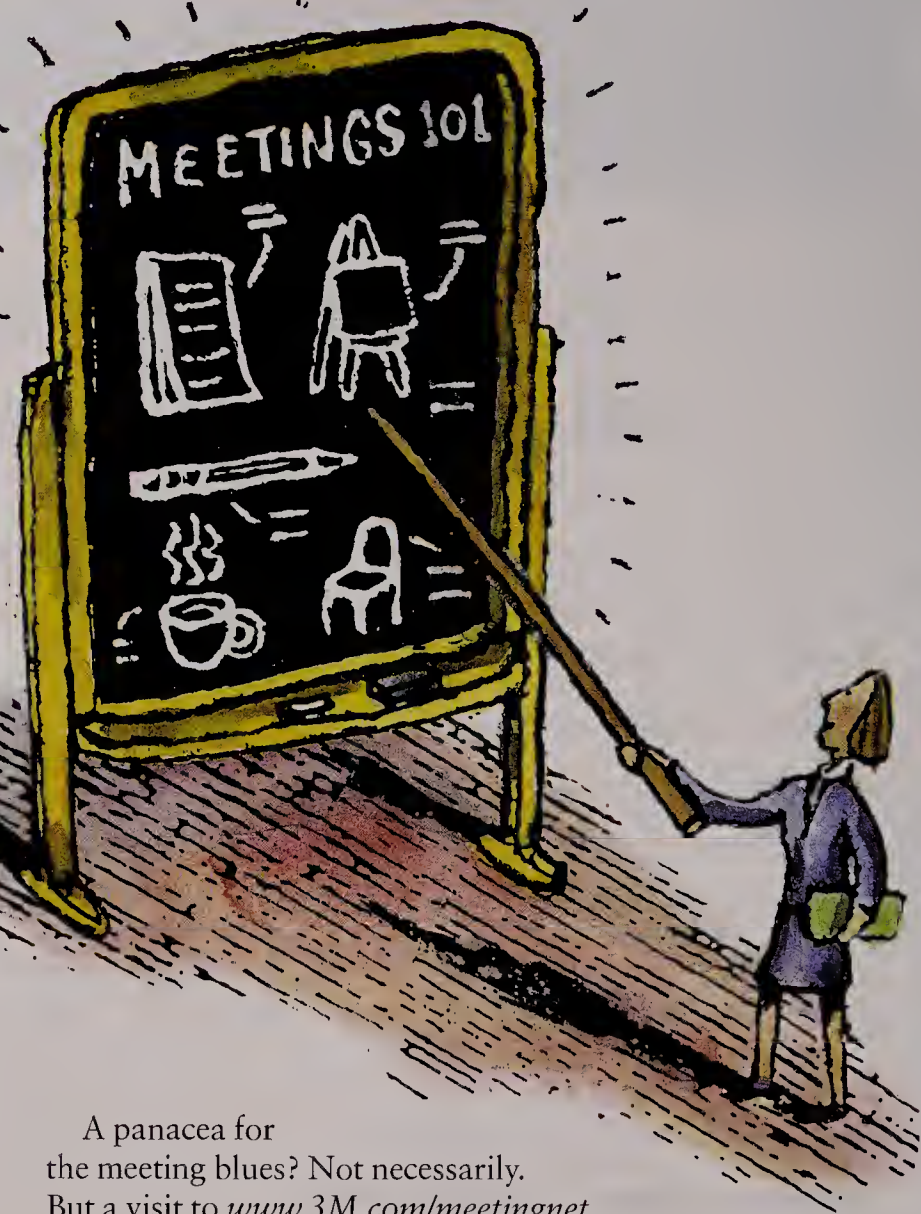
Meeting Management

Meeting Me in St. Louis

EVERY WEEKDAY IN THE UNITED STATES businesses hold between 11 and 12 million meetings. You might feel like you attend every one of them if you're a typical caffeine-injected, Day-Timer totin' executive with barely enough time to read your e-mail. Since you can avoid only so many meetings before your assistant runs out of excuses, perhaps you could benefit from a visit to the 3M Meeting Network, a Web site from 3M Corp. that offers scads of free information on how to run meetings more efficiently.

The Meeting Network's offerings include a research center, product selection guides, a bookstore with recommended meeting reading and a listing of 3M's free meeting guides, which are available in three different languages and address such topics as "Blasting Barriers with Brainstorming." Visitors can also check out a collection of nightmarish stories describing meetings from hell.

3M created the network to address the changes taking place in businesses as they move toward a team-based environment. "It used to be that in meetings, people planned the work. Now the meeting is where the work is happening," says **Michael Begeman**, manager of the 3M Meeting Network, who also cites an increase in remote meetings as another factor that has created a dire need for efficient meeting management.



A panacea for the meeting blues? Not necessarily. But a visit to www.3M.com/meetingnet is certainly a suggestion worth adding to next week's agenda. ■

ILLUSTRATION BY DANIEL BAXTER

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Information Micromanagement

Our new obsession with tracking corporate knowledge purports to save money. Does it also stifle creativity?

BY MEGAN SANTOSUS

DURING AN IMPROMPTU OFFICE LUNCH A FEW years back, a colleague and I started talking books. I mentioned that I had just re-read *The Killer Angels*, Michael Shaara's fictitious account of the Battle of Gettysburg. Filling her in on the details, I offered a historical analysis: Union Gen. George Meade's strategy didn't win the battle so much as did the fact that the Confederate troops relied on outmoded tactics in the face of modern weaponry.

As I explained, her face transformed from a look of patient indulgence to one of mild excitement. She had been struggling to write the opening paragraphs of an article, and my "old tactics, new technology" bit struck her as a perfect introduction for her story. (See "The Chain Gang," *CIO*, August 1995, or visit www.cio.com/archive/080195_supply.html.)

Such an informal exchange demonstrates a sticking point with knowledge management programs: Organizations that formally codify knowledge do so at the expense of ad hoc conversational brainstorming, and creativity is the ultimate victim.

Corporations can, in theory, realize significant bottom-line performance gains capturing intellectual capital, so it's not surprising to find many organizations using technology to capture, analyze, categorize and share what employees know. Need a leg up on the competition? Knowledge management proponents would have you collect every bit of corporate know-how in a database or Lotus Notes application and let employees access it to their hearts' content.

But here's the rub: Much of what is useful often can't be neatly categorized. What's more, the mere act of typing infor-

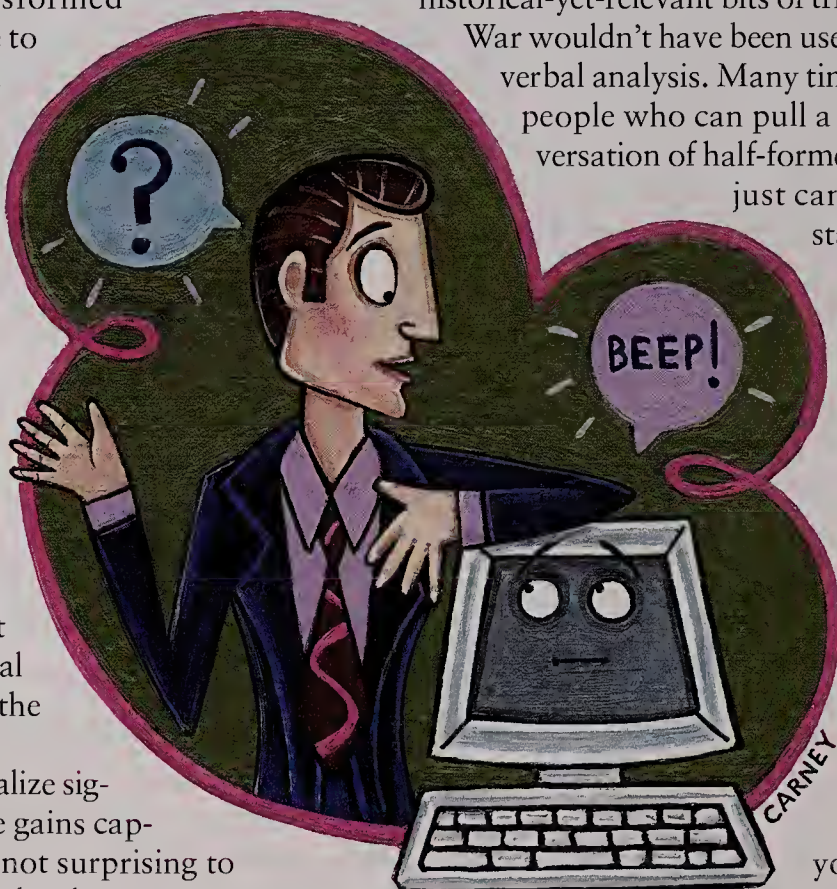
mation into a database frequently robs it of the intuitive spark generated by face-to-face conversation. Technology, for all its speed and accessibility, can't run with an idea and brainstorm it into something innovative. It can't easily combine two bits of data stored in separate memory banks into a new insight. Nor can it use visual cues for inspiration or parlay a chance conversation into a monster new idea.

Even if CIO Communications Inc. had a Lotus Notes application in which we could enter our personal reading habits or historical-yet-relevant bits of trivia, my knowledge of the Civil War wouldn't have been useful without the accompanying verbal analysis. Many times, creativity comes from two people who can pull a nugget of insight from a conversation of half-formed ideas and observations. You just can't reproduce that by reading static facts in a database.

That's not to say that all efforts at managing knowledge are futile. Certainly, information about best practices or lessons learned can be entered in a database, shared among employees and can prevent work redundancy. But in effect, such knowledge management practices merely help eliminate the constant reinvention phenomenon commonplace at large organizations. You may not reinvent the wheel, but neither will you invent a new mode of transportation. When it comes to

major breakthroughs—and even small creative revelations—nothing beats old-fashioned human interaction. And the best way to encourage that is to promote an environment where casual encounters can lead to serendipitous discoveries. **CIO**

Features Editor Megan Santosus can be reached via e-mail at santosus@cio.com.



When only the unexplored is ahead

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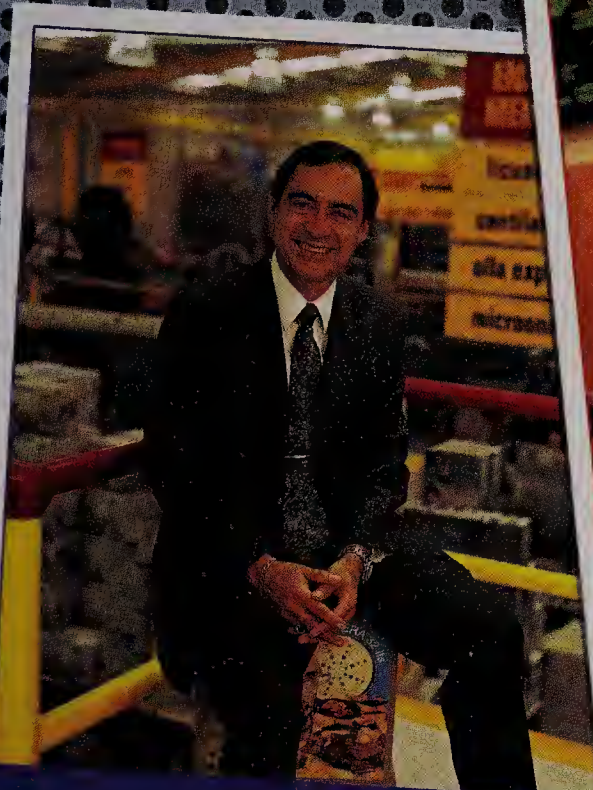
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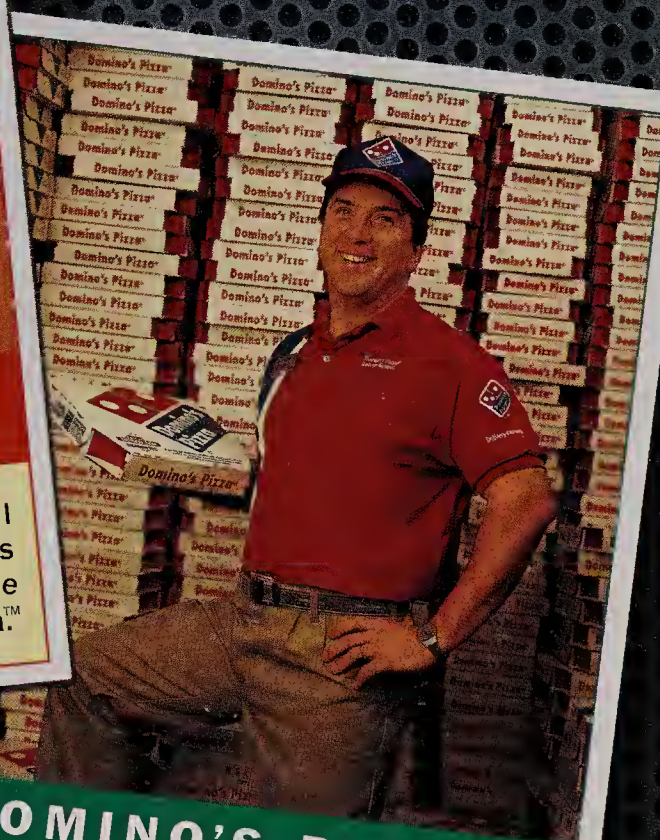
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Packaging Knowledge

Has your knowledge management system become a junkyard of unusable data? Make it useful with effective packaging.

BY PAUL S. MYERS AND RICHARD W. SWANBORG JR.

MANY COMPANIES TODAY HAVE MADE tremendous investments in knowledge management systems. Corporations such as IBM Corp. and Ford Motor Co. have appointed chief knowledge officers to champion and oversee their knowledge management efforts. Scores of businesses are investing in intranets, Lotus Notes and other types of knowledge repositories, enabling employees to access a company's store of best practices and lessons learned.

As they hasten to harness their intellectual capital, however, many companies are acquiring knowledge management tools without giving enough thought to the quality and value of the content those tools are intended to carry. Filtering, editing and organizing pieces of knowledge—what we call packaging—is an essential though frequently overlooked component of successful knowledge management investments. By packaging knowledge, managers will ensure that it proves useful, provides value and encourages application of that knowledge to address business issues.

Make It Useful

An abundance of unfiltered data renders most knowledge management systems ineffective. Knowledge bases are filled with meaningless documents, anecdotes, mundane discussion threads and other material of little practical use to anyone. Sensing that it's a waste of time and effort, many employees stop contributing to or relying on knowledge databases, thus thwarting their potential value.

For example, a large consulting firm encouraged employees to contribute to its knowledge management system by

making contributions an important factor in determining employee bonuses. They also built a central repository to make those submissions accessible worldwide. The predictable result was a database full of relatively low-quality content, ranging from lengthy process reports ("this is what we did") to presentations that, because they lacked background context, were of no use to anyone. Realizing the problem, the firm hired dedicated staff to refine, edit and structure the content. The repository became what it was intended to be, a timesaving source of useful information.

Knowledge packaging translates and structures information into usable knowledge. (See "Make Your Knowledge King," Page 28.) Content development and packaging are labor-intensive; instead of merely slapping the latest report or article on an intranet, a knowledge base contributor needs to assess its value and package it in such

a way that its usefulness is readily apparent. The packaging that most clearly communicates the content's worth might take the form of a memo, a paper, a presentation, hypertext media, a video tape, a course syllabus, a directory or an information map. It is unreasonable, however, to expect overburdened employees

to refine their contributions to a central knowledge repository without training or guidance. The guidance may involve making templates, providing examples or giving feedback on what employees submit. Employers must also enforce the value of this endeavor by providing time for employees to make con-

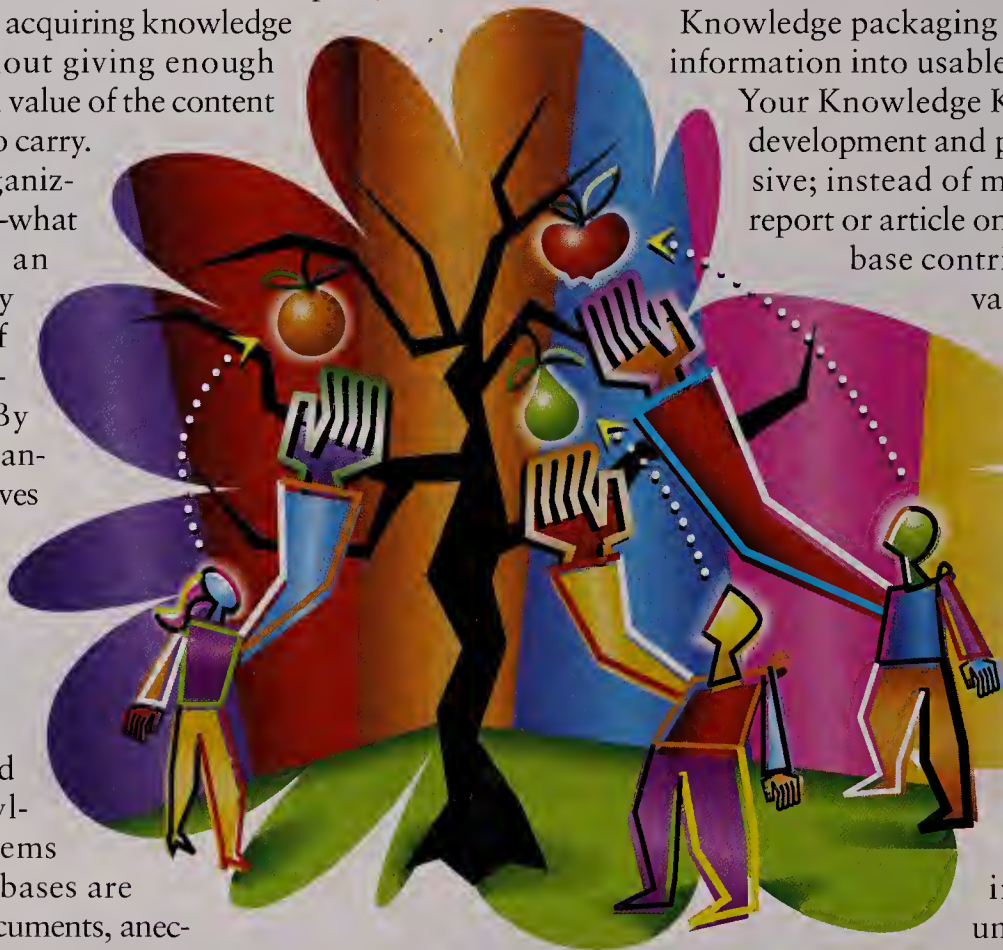


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Intellectual Capitalism

tributions and do research. If staff resources are limited, consultants or other temporary professionals can be hired to lend their expertise. Companies can draw on the skills of writers and editors, graphic artists and even Web page designers, among others, to transform their stores of

lessons learned and best practices into usable knowledge. Cost estimates for developing a set of materials for a well-defined topic area range from \$5,000 to \$250,000; a good rule of thumb is that high-quality, ready-for-use content can cost as much as \$1,000 per page to create.

Make Your Knowledge King

1. Identify knowledge. The first step in packaging knowledge involves identifying general domains or specific topics and then finding the knowledge that fits those topics. Ways to assemble that knowledge include conducting new research such as benchmarking activities or cataloging employee experiences.

2. Segment your audience. Identify the targeted recipients for the knowledge and sort them into groups. One example of likely groupings includes CEOs and other executives, senior managers, managers and all other staff. Identify the fewest segments possible, but make sure they're mutually exclusive.

3. Customize content. Select the relevant information from the knowledge base (for example, reports, process diagrams) and tailor it for each segment. Be sure to provide the appropriate level of detail for each audience. A project manager, for instance, requires a level of detail about resource scheduling practices that a business unit leader likely would find a distracting annoyance. Context is important. Present the information so each user can readily see the connection with his or her tasks and responsibilities.

4. Choose an appropriate format. Select one or more formats—paper, electronic, video, multimedia—for delivering the intellectual material. Reports and other paper documents offer portability and are the most familiar format for learning. Electronic documents offer easy customization and updating and can be e-mailed or posted on an intranet. Video or other multimedia can add visual interest and interactivity.

As with any marketing strategy, a distribution plan for intellectual capital must identify the end user and his buying habits. Recipients' preferred methods of learning should be taken into account when choosing a format. For some, courses or seminars suit their learning styles, while others prefer self-paced, computer-based training. The size of the target audience is also important if only to achieve economies and get the most from the investment in packaging.

5. Organize content. Tables of contents and indexes that allow quick and meaningful navigation save time, avoid frustration and encourage frequent use. The best layouts facilitate skimming as well as reading, place key points in prominent position and, for electronic documents, provide hypertext links and search capability when possible.

6. Market-test format and content. The content should be tested and revised based on the reaction of a sample of end users. Give the pilot group a checklist for rating the package's usability, clarity and overall value. Ask for specific suggestions for improving it. Incorporate those suggestions and test the results. Remember: The users know best how they find, employ and apply information and knowledge to do their jobs well. —P.S. Myers and R.W. Swanborg

Make It Relevant

Of course, the most well-intended investments in knowledge and packaging are wasted unless the results are relevant to a designated audience. Ensuring relevance may involve segmenting and even customizing the content for a particular group. Compare the glossy, executive-oriented *CIO* to the more staid, academic *MIS Quarterly*. Although broadly speaking both publications cover the same topics, the content of one could never be mistaken for that of the other. Even the approach of the two magazines to an article on the same topic—legacy systems, for example—would differ enormously in editorial focus and tone as well as in design and layout. The explanation is simple: Each addresses a different audience with different objectives.

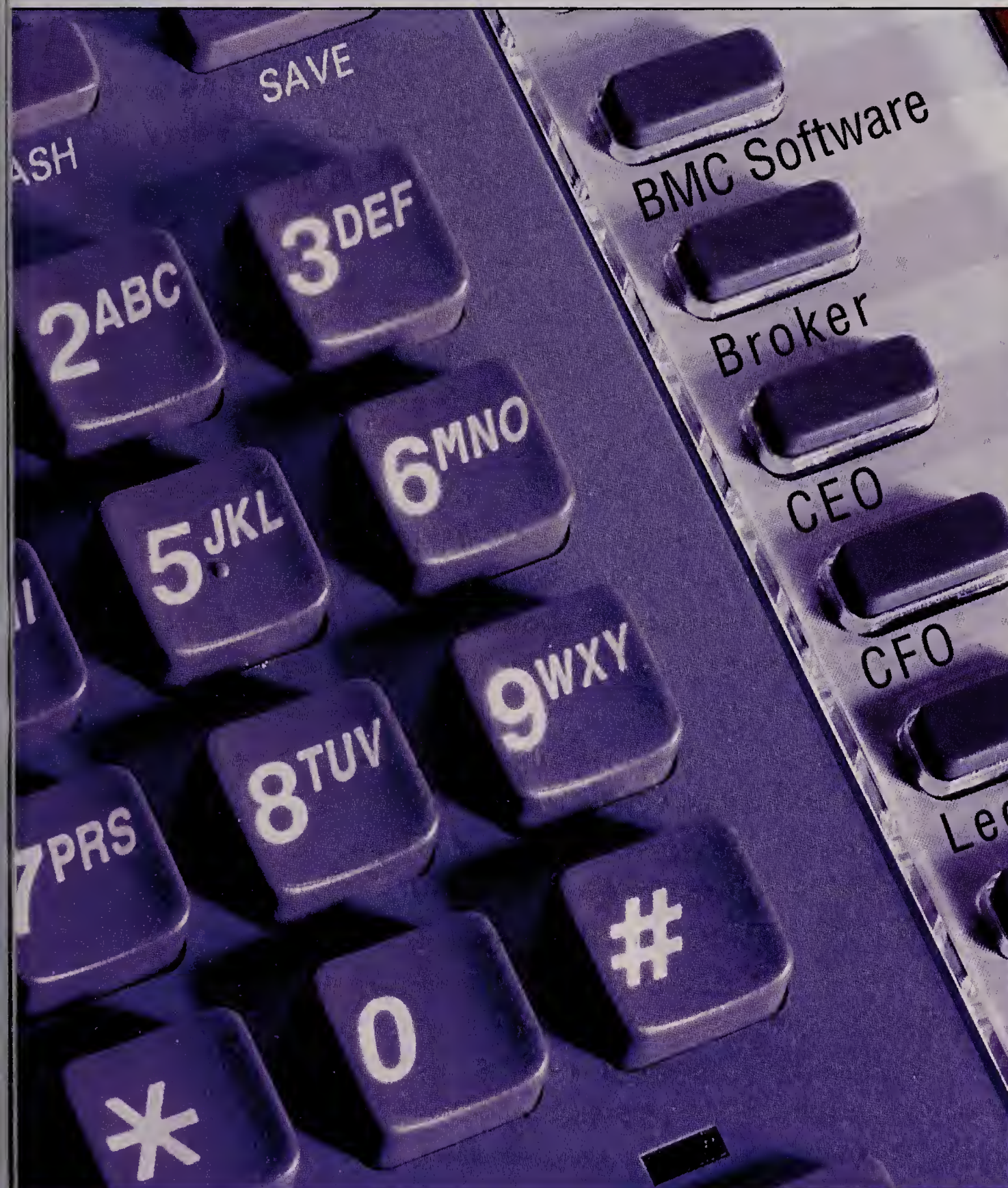
Because knowledge is generally shared with employee groups who have differing priorities and backgrounds, most packaging efforts require several rounds of review and revision. Selected end users should evaluate the material and provide ideas for how to improve its content and style. This important step provides a valuable quality-control function and also increases the perceived credibility and value of the content.

Successful knowledge management involves more than investing in technological infrastructure and telling employees to make use of it. To capitalize on the wealth of intelligence available in an organization, knowledge must be packaged in such a way that it's insightful, relevant and useful. To support these efforts, budgets need to include allocations for content development either by staff or by external consultants. Without these critical investments, knowledge management will be relegated to the trash heap of disappointing business fads. **CIO**

Paul S. Myers, managing principal at ICEx and editor of the anthology Knowledge Management and Organizational Design (Butterworth-Heinemann, 1996), can be reached at myers@icex.com. Richard W. Swanborg Jr., president of ICEx and a faculty member at Boston University's School of Management, can be reached at swanborg@icex.com.

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Kaman Sciences' Vice President of Advanced Systems Chuck Eklund (left) and CIO David Anderson had to climb some steep walls, but they eventually recovered from a disastrous project.



If At First You Don't Succeed

...you could be fired—or given another chance, as was David Anderson at Kaman Sciences. He was the project leader on a big-ticket technology failure, but he turned fiasco into success through equal parts humility and determination.

BY CAROL HILDEBRAND

DAVID E. ANDERSON REMEMBERS THAT 1994 MEETING THROUGH THE HUMBLING LENS OF hindsight. He and Chief Operating Officer Chuck Eklund had trekked from Colorado Springs, Colo.-based Kaman Sciences Corp. to “Corporate,” the Bloomfield, Conn., headquarters of Kaman Sciences’ parent company, Kaman Corp.

They were trying to get the go-ahead from then-President Harvey Levinson for a mission-critical systems revamp at Kaman Sciences (KS), a builder of military software and electronics. Anderson had been recruited from his operational role leading a project for the Air Force Weapons Lab specifically to head up this big-budget project. “Harvey wanted to know who would be responsible,” recalls Anderson, now KS’s chief information officer. “He said, ‘As long

Reader ROI

INDUSTRY ANALYSTS TOSS AROUND NUMBERS LIKE 70 percent when they talk about technology project failure rates. Project managers who want to beat the odds should read this article to learn

- ▶ Why the newest technology may not always be the best
- ▶ Why the role of consultants in a project should be given careful consideration
- ▶ When you should scrap a project, cut your losses and move on

ILLUSTRATIONS BY SCOTT MATTHEWS; PHOTOGRAPHY BY KENT HANSON

LESSONS LEARNED

Anderson and his project team encountered plenty of problems, but they learned from their mistakes.

PROBLEM 1

Too many road trips "The number-one failure was me," says Anderson. "During 1994 and 1995, I was traveling to three different places for several other projects. I was gone and we were understaffed here."

THE FIX

Be a homebody Anderson finally put his foot down as the project's problems swelled in magnitude. "I went to our president and told him that we have a failure on our hands, and to fix it, we need to do several things. The number-one thing is that I need to be here full time."

PROBLEM 2

Dealing with consultants Anderson and his team hired consultants from Oracle to help implement the financial package but tried to cut costs by using them part time.

Because Kaman Sciences was a software firm, he thought his team could save money by doing much of the work themselves. "We didn't realize [using part-time consultants] was unusual," Anderson says. But because KS wasn't a conspicuous consumer of billable hours, "We got leftovers and newbies, and we didn't have a consistent person coming in," says Anderson. Shaw, whose group had the most interaction with the Oracle consultants, agrees. "We'd train one and he'd leave, and we'd have to train another," she says. What's more, she says, the consultants did not want users to be involved in the implementation. "One of my most vivid recollections," she says, "is of a consultant sitting here telling me he couldn't think of a way for me to be involved."

(Sandy Sanderson, a senior vice president at Oracle Consulting, disagrees with Anderson's and Shaw's characterization of Oracle consultants. All of the consul-

as I know whose job is on the line, I'll approve the project.' And I said, 'It's me. My job is on the line.'"

Two years and several hundred thousand dollars later, those words banged around in his head with disastrous clarity. As Anderson sat in his cluttered office with Controller Peggy A. Shaw and a couple of other colleagues trying to untangle the project's intractable problems, "We finally had to admit we had a failure on our hands," he says. Worse, he knew that he bore ultimate responsibility for the fiasco.

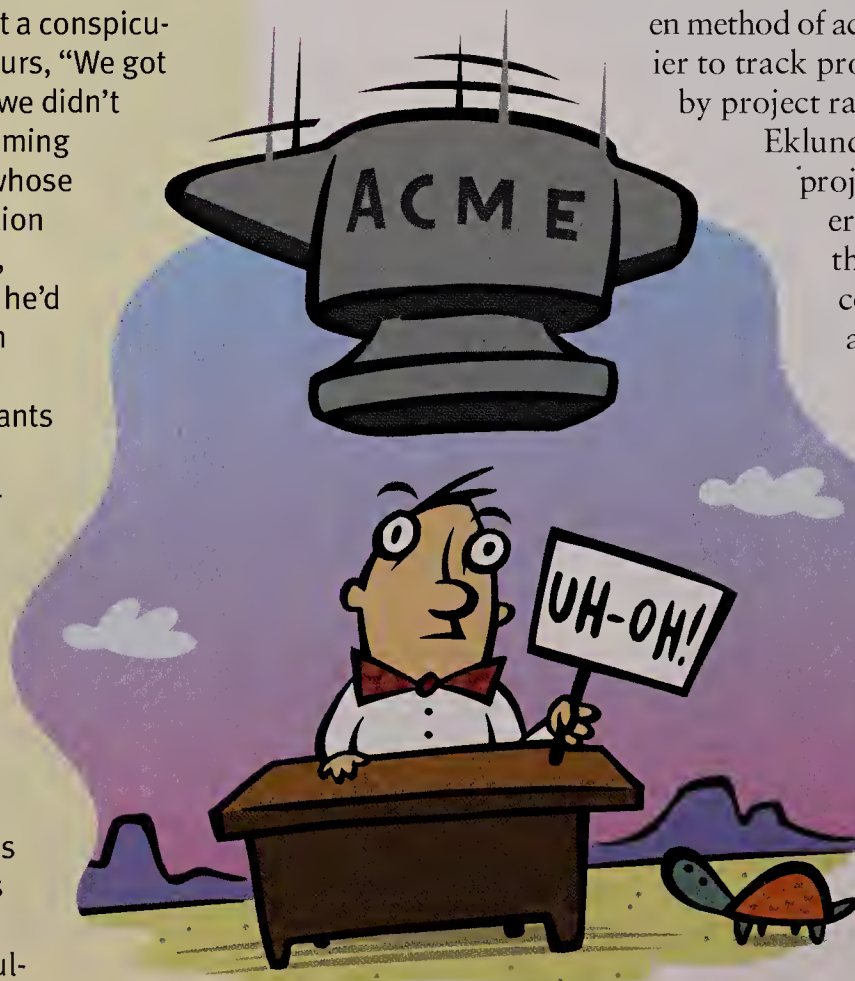
It was a jarring stumble for Anderson, who'd spent 15 years successfully running software projects for major defense contractors. "My whole world had fallen down around my ears," he says. "It was not the happiest time of my career."

Anderson has plenty of company when it comes to failed technology projects. Forty percent of IS development projects get axed before completion, and an additional 33 percent run into budget and deadline problems, according to The Standish Group International Inc. in Dennis, Mass. (See "When Bad Things Happen to Good Projects," *CIO* Section 1, Oct. 15, 1997, or visit www.cio.com/archive/101597_bad.html.)

Fortunately for Kaman Sciences (which has since been bought by ITT and renamed ITT Systems and Sciences Corp.), Anderson isn't afraid to acknowledge his mistakes and learn from them. And fortunately for Anderson, KS let him stick around to apply those lessons. After a couple of months of "crow-eating and analyzing the situation," he and his team managed to snatch success from the jaws of unemployment. They discarded the failed financial applications, the main source of their problems, and reinvested in a more established product that, he says, does a better job of answering KS's business needs.

THE DISASTER: THE IDEA BEHIND THE ORIGINAL SYSTEM renovation was to move all the company's software applications—such as financials, payroll, HR and some custom-built applications—off its mainframe to a client/server system. At the same time, senior executives wanted to switch to a project-driven method of accounting, which would make it easier to track project finances by divvying up costs by project rather than function. Basically, says Eklund, the company wanted to give line project managers faster access to fresher project-cost information, and they thought a client/server architecture combined with a new financial package would best fit their needs.

"We needed to provide information in such a way that managers could take a look and say, 'Hey, this item is over budget,'" explains Anderson. The old system had forced accounting and IS staff to dig through the mainframe to find answers to project questions. "It took a day or more to answer queries," says Anderson. "It was slow and awkward enough that managers didn't care to do it." Instead, they





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tants Oracle sent to Kaman Sciences were experienced in Oracle Financials, he says. Although one employee was new to the company, he already had extensive experience with the software.)

THE FIX

Buy loyalty The Computer Associates (CA) implementation began with a feeling of déjà vu. "They wanted to set up a [consultant] project manager to run the project, and we'd had quite enough of that," says Shaw. Instead, Anderson hired Marc Hetrick, an eight-year CA sales and implementation consultant who was sick of the travel his old job required. Hetrick's hiring gave KS several valuable advantages. First, Hetrick had installed Masterpiece at dozens of sites and knew the technology inside out. He also knew CA inside out and who to call for advice. And because Hetrick was a KS employee, he didn't have to serve the needs of both vendor and customer.

PROBLEM 3

Technology for technology's sake Not unlike the weekend golfer who convinces himself that this year's titanium driver will

punted, keeping private spreadsheets of project costs that often did not agree with the corporate software's numbers. Moving to a client/server system and renovating the financial process would let project managers access the data directly from their PCs, freeing up both the query bottleneck and the time accounting and IS spent looking up answers. The client/server cheerleaders described the systems overhaul as "smashing the glass office," referring to the glassed-in data center that housed the mainframe.

KS management wanted "client/server with a relational database in an open environment." Roughly translated, that meant a system of networked personal computers linked to more powerful PCs called servers, which would run certain transactional, or back-office, programs. It would also feature a relational database, which is rather like a card catalog with strings that connect related cards; pulling one card, or term, on a database will bring up a host of related cards. This makes searching and maintenance relatively simple. The system would also be open, which means that any kind of computer, from PC to Mac, would be able to run on it. All the programs on KS's mainframe would be transferred to the new system. These included back-office financial applications and some custom-built software such as a visitor-access security program (much of KS's military work requires clearance), a program for classified documents and a third for managing contracts.

When it came to choosing technology, KS brass piped up again: They wanted Oracle Corp.'s relational database. Anderson's team also chose Oracle's financial applications to get an accompanying price break—even though the financial packages did not have many of the functions that KS's accounting team wanted, and Shaw's group feared they would have to shoehorn their business practices into ill-fitting software. This less-than-perfect fit was partially a function of KS's business prerequisites for

Fish or Cut Bait?

Pay heed to six project vital signs

WHEN EXPERIENCED BACKPACKERS HEAD OUT TO the mountains, they make sure to plan "bail-out routes" in case of emergency. Project managers would do well to take a leaf from the same guidebook, although most prefer the bushwhack method of project management, according to Gopal K. Kapur, president of the Center for Project Management in San Ramon, Calif. He recommends that managers and project sponsors do the following: Be aware of the six vital signs noted below, define comfort thresholds at the inception of a project, review the vital signs monthly and publicly post the results of each review. "Doing this will set up an environment where bad news can be conveyed early enough to head trouble off," Kapur says.

1. Status of the critical path. The critical path is a big-picture map of how the project should proceed, taking into consideration such factors as money, resources and time. Kapur recommends that if the status of the critical path is off by 15 percent, the team should try to figure out how to get back on track. He says that if the number rises to 20 percent, the team should adjust

the scope, invest more money or reduce the quality of the end product. If the project is off by 25 percent, the project should be halted.

- 2. Deliverable hit rate.** The team's success at completing small project subtasks or deliverables.
- 3. Milestone hit rate.** Similar to the deliverable hit rate, except it refers to the completion of major project tasks.
- 4. Ratio of issues to deliverables.** "Issues" is Kapur's word for unanswered questions, which could also be called problems. "If the number of issues exceeds the number of remaining deliverables, you don't have a plan anymore; you have a block of Swiss cheese," he says.
- 5. Planned budget versus actual budget.** If a project goes too far over budget (using Kapur's 15/25 percent guideline), managers must reexamine the ROI to see whether the project costs are still justified by the benefits.
- 6. Planned resources versus actual resources.** This refers to items such as employees, hardware, software and time. Project managers should view this sign in the same way they view the budget sign.

—C. Hildebrand



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COVER STORY: CHANGE MANAGEMENT

shave 10 strokes off his game, the decision makers at KS thought Oracle's technology would translate into business advantage. "Don't do technology for technology's sake," warns Anderson. "I was too enamored of being on the cutting edge. In this case, we were driven by technology. I ramrodded through what we were going to do, and I was wrong." The plain truth, he says, is that "Oracle is more cutting edge than CA."

THE FIX

Focus on business needs first

Anderson and Shaw eventually realized that although Oracle's financial applications were sexy, they were not necessarily function-rich. CA's software lacked the latest-and-greatest cachet, but it fit KS's accounting needs better. Anderson says the Oracle features, such as elegantly designed tables, chiefly benefited the IS folks, not the accounting group. By choosing CA, his group succeeded in putting the needs of the business first.

This is a tough lesson to learn: Not only did Anderson want the technology du jour (Oracle), but so did Shaw, management and the IS staff. As Shaw explains it, embracing a new paradigm in technology is very popular within the company. However, if you greeted said paradigm with less-than-open arms, "you were a speed bump. All the bosses embraced the concept. For us to say as users that we wanted to go back to a company [Computer Associates] that we'd already used was unacceptable." So Anderson played the heavy and made the decision.

But Anderson didn't realize that choosing CA would cause a revolt among his staff. "Programmers tend to be purists," he says. "We lost people over this. They felt we were going back to archaic technology. I was devastated when these people quit, but it was all about technology for technology's sake. Don't let your people railroad you."

PROBLEM 4

User disenchantment "I come from such a technical background, I truly misunderstood the significance of getting commitment from the users," Anderson says. What's more, he says, he didn't understand the complexity of the financial users' business needs, which led him to underestimate their importance. Not surprisingly, he ran into a prickly user base when installation time came around. Nobody likes being forced into major changes without lots of input, and

its systems. "As a defense contractor, we have requirements that no new system yet meets," Anderson says. His team knew that any financial software they chose would require extensive customization.

Anderson says the Oracle team promised to modify the financial applications within the year, so Anderson's team migrated the custom applications over to the new client/server system and database while they waited for Oracle's Financials to get ready for prime time. In the meantime, Anderson was yanked back into trouble-shooting some defense-related work, which kept him on the road for long periods of time. Anderson's absences were costly: When Oracle's

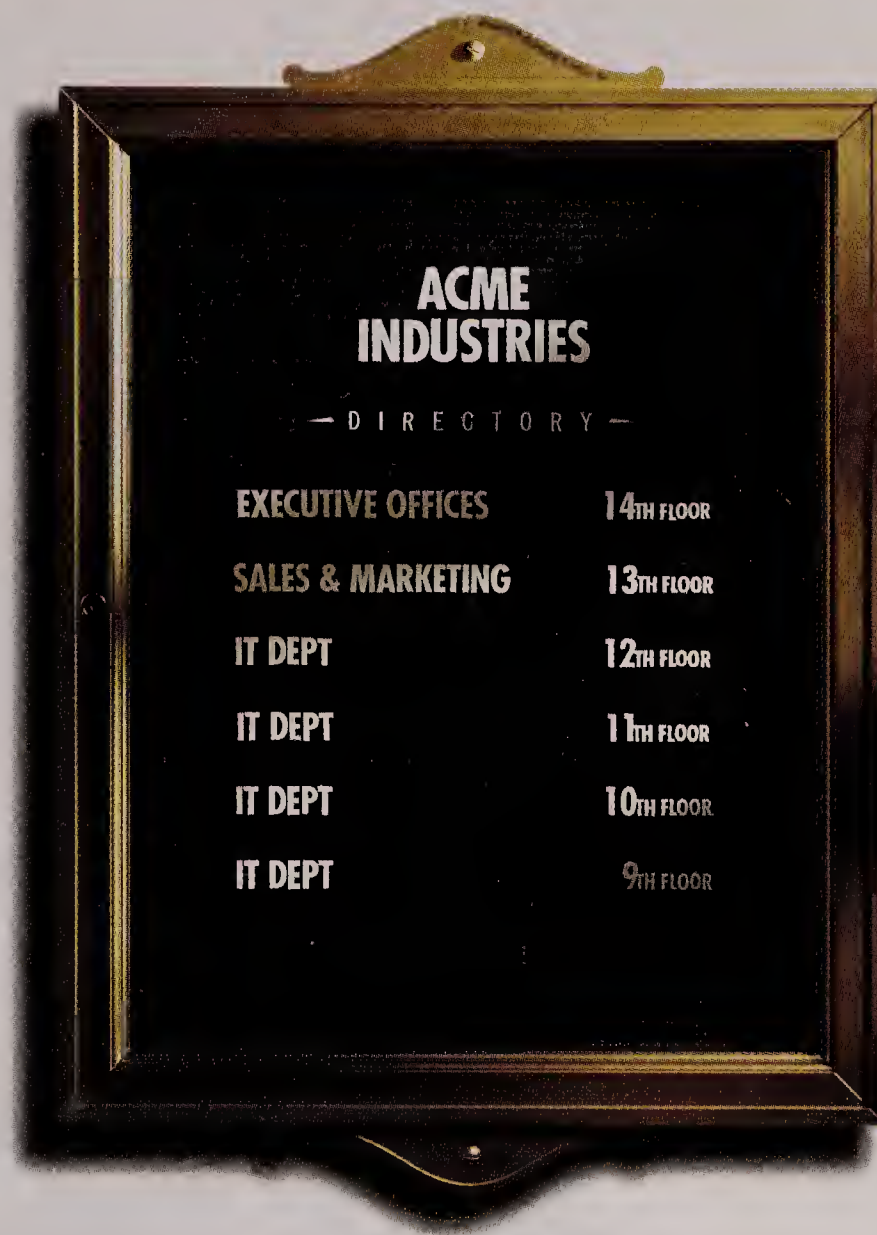
financial packages were ready to be piloted, all hell broke loose. Members of the accounting group complained bitterly that the new software didn't do what they needed it to do, and Anderson says Oracle's assurances that the functionality problems would be cleared up

did little to diffuse the accounting group's anger. In the meantime, the IS staff ran into knotty problems maintaining the client/server system: KS users were loading software applications onto their PCs that wiped out the background systems needed to run all the new technology.

The IS staff could do little to stop the practice because workers needed to use whatever software their government contracts required. "People would try to work with software and it wouldn't work," says Anderson. "We had three or four IS people who were spending all their time trying to fix this problem."

THE RECOVERY: ANDERSON AND HIS CREW regrouped. After intense and lengthy deliberations, they dumped Oracle Financials and waved goodbye to several hundred thousand dollars' worth of licensed software, roughly a third of what the project would eventually cost. Shaw says they could have made the original software work, but it would have been an expensive fix. "We did a financial analysis and found that it was going to cost more in consultant time with Oracle than it would to start over with another company," she says. KS then tested a product from Deltek Systems Inc. in McLean, Va., chiefly on the recommendation of a powerful supporter at corporate. (Anderson says that while KS people didn't love Deltek's product, none of them had enough credibility after the Oracle debacle to shoot it down.) Shaw notes that she worked closely with the Deltek team but that the soft-





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COVER STORY: CHANGE MANAGEMENT

the accounting group was no exception. They fought a vigorous battle, objecting to Oracle Financials at nearly every opportunity. "I would come back from a trip, and Peggy [Shaw] would be waiting to greet me with, 'Dave, this is awful. This is not a system we can use,'" says Anderson.

THE FIX

Seek the input of users upfront Eklund set up a technology steering committee that met weekly during the post-Oracle deliberations. "There's always tension between MIS and users," says Eklund. [The committee] made sure that users were very involved in the CA implementation."

It also served as a vehicle for getting public agreement by all parties. "Chuck was good at getting people to sign off on things in a public forum," says Anderson. "It reduced tension incalculably."

PROBLEM 5

Immature technology Aside from the fact that the Oracle software lacked vital accounting and payroll functions, it featured preformatted financial reports that required users to learn complicated software to access them. But at the time, Anderson says, the Oracle software had the fewest holes.

THE FIX

Time Although the project problems and fixes added about a year to the project deadline, the delays gave technology a chance to mature. For example, an intranet wasn't even a glint in a programmer's eye when KS first planned the original system revamp. But when Anderson's group began to understand the benefits of an intranet in 1996, they "went on an ardent campaign to make the Web" a centerpiece of the new system.

"If we had tried to go live Jan. 1, 1995, which was our original deadline, we would have never had the intranet," he says. "It's remarkable the way technology has changed in the past couple of years." It also makes history look rosier in hindsight. For example, while Anderson's travel schedule helped derail the first project, the delay also helped the technology mature. Sometimes, says Anderson, "[The delay] looks like divine guidance."

ware, like Oracle's, demanded that her accounting group change the way it did business to fit within the confines of the applications. Anderson finally settled on Computer Associates International Inc.'s Masterpiece client/server-based financial software, in part because KS's financial staff was familiar with the mainframe version and in part because it had the functionality Shaw wanted.

Also, with only a few months left in the project, Anderson's team started experimenting with intranet technology, which would allow KS employees easy access to valuable information. Excited by its possibili-

*"We finally had to **admit** we had a **failure** on our hands," says David Anderson, CIO of Kaman Sciences. Worse, he knew that he bore **ultimate responsibility for the fiasco.***

ties, the team decided to build an intranet-based front end for users. Finally, they added a third layer to the client/server architecture that let users install software without disturbing what was already there.

It was an agonizing few months—Anderson says the decision-making process involved lots of analysis and not a little fear, as the group worried about its ability to avoid another debacle. And even after they chose the new software, the project people still had to make it work.

THE RESULT: ANDERSON PROUDLY DEMONSTRATES THE NEW system they built and have had online since Jan. 1, 1997. The system's intranet-based front end lets users access HR information, fill out billable-hour timecards online and check the daily performance of KS's 401(k) mutual funds, and it provides links to various military procurement sites that have information about forthcoming requests for proposals. Most important, project managers can use the intranet to assemble customized budgetary reports for each project, using up-to-the-minute financial information. "They can see what's been charged to their project and break it down by specific charges," says Anderson. "It lets them see what's going on with each particular project."

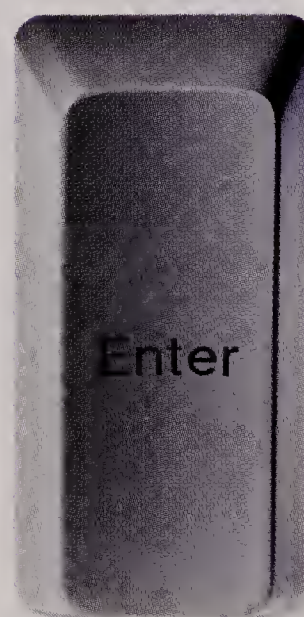
Anderson and his group have not yet been able to pin down a specific ROI on the system, and they have a laundry list of enhancements that will probably take another year to add. But judging from the number of daily hits the intranet is getting, Anderson considers the project a success. "The company is operating a lot better than ever in terms of getting data," he says. Eklund, who is now vice president of advanced systems, laughs, "It would be interesting to see what would happen if we tried to take any of this stuff away now." **CIO**

Senior Editor Carol Hildebrand can be reached at cjh@cio.com.

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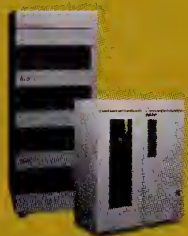
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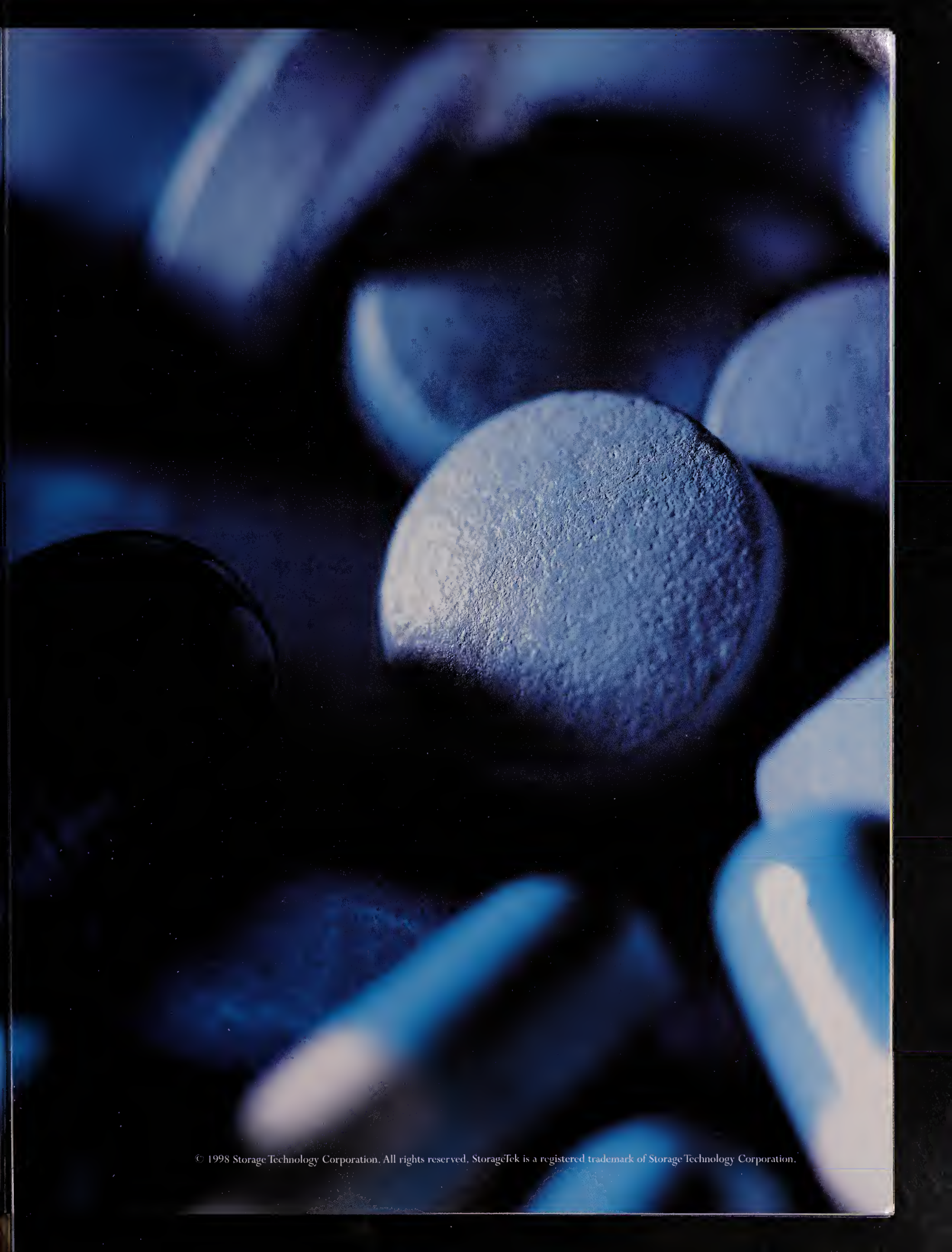
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Outside Inspiration

BY LAUREN GIBBONS PAUL

Outsourcing R&D projects can help research organizations address the challenges of faster cycle times, changing technology and skills shortages. But before you decide to buy your brainpower, you'd better be aware of the pitfalls.

TEN YEARS AGO, WHEN THE WORLD'S MAJOR nations agreed to stop producing chlorofluorocarbons (CFCs), chemical dynamo DuPont had a serious problem.

The largest chemical company in the world, E.I. duPont de Nemours & Co. had invested heavily in researching and manufacturing CFCs, which had long been used in aerosol cans, refrigerators and air conditioners. The company needed to develop CFC alternatives—and fast. To help it figure out the best way to produce CFC substitutes, DuPont outsourced research to more than 20 organizations, including academic institutions, think tanks and private companies.

That outside research initiative was a major success, according to Parry Norling, planning director for DuPont in Wilmington, Del. The company ceased production of CFCs in 1993—three years before the internationally agreed-upon deadline—and now sells CFC alternatives in five different product areas, including refrigeration, propellants and cleaning agents.

DuPont may have outsourced \$5 million of the \$400 million it spent on CFC research, but the company saved that amount many times over by not doing the research in-house. "It would have cost us 10 times what we paid our partners if we'd had to do this ourselves," says Norling, citing the expense of specialized equipment and personnel needed for such research. However, speed was a more pressing concern than money. DuPont could not afford to wait until the CFC ban was in place to

Reader ROI

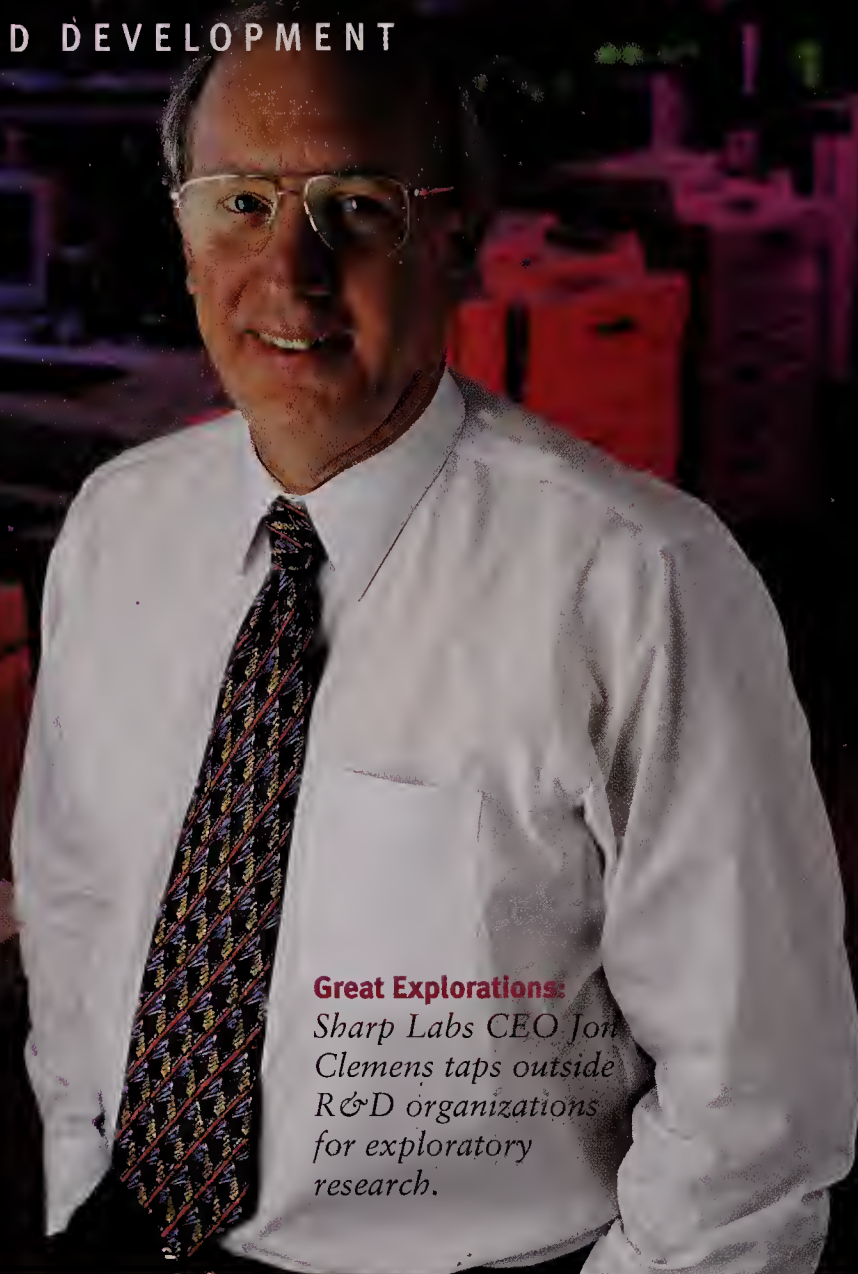
THIS ARTICLE WILL HELP READERS

- ▶ Evaluate the pros and cons of outsourcing R&D
- ▶ Learn why specialized IT support of R&D is critical—whether R&D is outsourced or not
- ▶ Find out how IT can improve synergies between R&D and other functions



The Big Chill: Planning Director Parry Norling, shown here in a refrigeration unit, made sure DuPont didn't get frozen out of the cooling business by outsourcing research for CFC alternatives.

RESEARCH AND DEVELOPMENT



Great Explorations:
Sharp Labs CEO Jon Clemens taps outside R&D organizations for exploratory research.

start searching for alternatives. "Time was the driver of the whole project," says Norling.

Many other companies are discovering what DuPont learned with its CFC experience. Namely, that outsourcing discrete R&D projects can be an excellent way for companies to gain access to the expertise and equipment that they do not have time or money to cultivate in-house. Companies that have outsourced for years also appreciate the flexibility it brings: Should you realize you've taken the wrong path, you can easily dismiss an outside team and hire a partner with the needed research expertise.

"It would have cost us 10 times what we paid our partners if we'd had to do this ourselves."

—Parry Norling

Nevertheless, executives agree that relying too heavily on contract research shops can be dangerous. Knowledge may well be an organization's most precious asset, and there's no question market-leading companies must have a firm grasp on the key technologies that drive their business. Although key technologies need not necessarily originate in-house, companies can't relinquish the responsibility of understanding how those technologies work and how to apply them. And executives must watch out for a number of pitfalls—including intellectual property issues and management challenges—when getting into these arrangements for the first time.

"We have the key research and development under our control. That's ours; we own it. We go outside for exploratory things," says Jon Clemens, president and CEO of Sharp Laboratories of America Inc. in Camas, Wash., the North American research and development arm of \$16 billion electronics maker Sharp Corp. Sharp Labs has outsourced several projects in the United States, including ones to Sarnoff Corp.,

a Princeton, N.J., subsidiary of SRI International.

Bill Sommers, president and CEO of SRI, applauds this approach. "Companies that are successful are in command of their key technologies. They will be truly expert and understand how those technologies work, what the trends are, what the threats are," he says.

You Can't Know It All

COMPANIES THAT PROVIDE R&D outsourcing services and their customers agree that outsourcing research is a growing trend. In the past 10 years, more and more companies have come to recognize that they don't know it all and should look to outside partners to get research done efficiently to solve critical business problems.

"We see a general realization among business executives that companies should do what they do best. They

are good at creating products but they are often not so good at research," says Ashok Boghani, vice president and director at Arthur D. Little Inc. (ADL), a management consulting firm in Cambridge, Mass. As part of its R&D outsourcing services, ADL helps "companies create a vision of where they want to be in 5 or 10 years," Boghani says. "We then help them identify what kind of development needs to be done and figure out whether it should be done in-house or outside." (For a look at the matrix ADL developed to help its customers decide whether to outsource research projects, visit CIO's Web site at www.cio.com/updates.)

Tackling Today's Problems

SOME BUSINESS EXECUTIVES SHY AWAY from outsourcing research projects, fearing that such research would be a multi-year, low-payback proposition, says Stewart Personick, vice president of information networking for Bellcore, a Morristown, N.J.-based communications software engineering company owned by the Science Applications

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International Corp. "Research is the 'R' word," he says. But while far-reaching research contracts extending several years into the future used to be the prevailing paradigm, today's contracts focus on the most pressing problems. "Companies want a breakthrough insight they can apply today. They want a return on investment," Personick says.

At least one Bellcore customer agrees. "We've transformed our research and development operations to ensure our focus is bringing solutions to BellSouth problems," says David A. Kettler, executive director and network vice president of science and technology for Atlanta-based BellSouth, a Bellcore client. "Ten years ago, my focus was five to eight years. Now, my focus is one to five years. That's changed the way we construct R&D teams."

Foreshortened technology life cycles and competitive pressures have shifted the emphasis to nearer-term results. "We're drinking out of a fire hose and trying not to drown," says Kettler.

Advantages

EXECUTIVES LIKE BELL SOUTH'S KETTLER and DuPont's Norling were relieved to get quicker results to real-world problems through outsourcing than they would have been able to achieve on their own. But immediacy is not the only advantage to outsourcing. Executives who have pursued a variety of research arrangements cite the following reasons for contracting out research:

FLEXIBILITY. Sharp's Clemens says outsourcing discrete research projects rather than hiring researchers for every new research initiative makes his company leaner and meaner over the long run. "It's not that [outsourcing research projects] saves you money particularly. But you can try many different things and go in many different directions without having to hire and fire people," he says. Often, companies embark on one line of research only to discover a better tack a few months later. When a company has outsourced a particular project, its management suffers no angst in terminating the agreement and hiring a different firm with the appropriate expertise. Most agreements give both parties to a contract research project the right to cancel with 30 days' notice, says Clemens.

DuPont's Norling appreciated that ability to change course when the massive CFC-alternative research project began to wind down about five years ago. "We didn't have to keep people on staff who were no longer needed," he says.

"I can create teams without worrying that I'll have to make hiring and firing decisions down the road. I can staff up to meet the peaks and valleys of the demand," echoes BellSouth's Kettler.

EXPERTISE. Research today nearly always requires experts who are in great demand in the marketplace. Companies that choose the right outsourcing partner gain access to a level of expertise, experience and equipment that few could afford to put together on their own. "You get to work with people with specialized skills, abilities, background and equipment," says Norling.

Contract research houses have a distinct advantage in hiring and retaining highly skilled researchers because they

can offer recruits a broad spectrum of projects, training and career advancement opportunities. It's hard for most companies to keep top-notch in-house experts motivated when so many exciting research opportunities exist elsewhere, says Bellcore's Personick. "We can provide our researchers with a broad range of different projects with different timeframes. They can publish if they want to or do nearer-term work," he says. Personick calls this a research "ecosystem," which only the largest inside research organizations and vendors like Bellcore can offer their scientists.

And since contract researchers come with expertise in the area to be researched, it gives the project a jumpstart, says Clemens.

Hazards

ALL IS NOT ROSY IN CONTRACT RESEARCH land, however. Research agreements are inherently tricky because

Strengthening the Bond

IS provides the information glue that makes R&D outsourcing arrangements stick—and solidifies the links between R&D and other corporate functions

It's not every day that IS executives are called upon to perform feats of geographical magic. But a few years ago that's exactly what Hank Morneau, director of scientific computing for E.I. duPont de Nemours and Co., was asked to do.

Morneau had to provide the right information-sharing and collaboration tools so that a team of in-house researchers based in Wilmington, Del., would feel as if they were working side by side with a team of 25 researchers from a contract research firm on the West Coast. The scientists were working feverishly to file the first patent claim on a new chemical compound.

Morneau's wizardry involved deploying a host of tools such as Lotus Notes for document exchange and discussion forums, Timbuktu Pro for screen sharing and CUSeeMe for desktop videoconferencing. Since the West Coast team was from an outside company, Morneau also mounted a secure server outside DuPont's firewall on which the information-sharing tools could run. "We had to equip these teams with the tools and capabilities to help them work as if they were next door," he says.

When it comes to supporting and facilitating contract R&D projects, data access and security issues top David Peltzman's list of concerns. As director of computing support for SmithKline Beecham Pharmaceuticals Corp. in Philadelphia, Peltzman says his job is to ensure connectivity and security of



Hank Morneau, director of scientific computing for DuPont, makes sure outsourced and in-house researchers feel as though they're working in the same building.

data with the outsourcer. SmithKline generally requires its R&D contractors to maintain technical compatibility with its systems so that data, reports and communications such as e-mail comply with corporate standards. "Our obligation is to keep the outsourced company informed of any relevant technical changes" as well as to review requests for external connections into the corporate network, says Peltzman.

Whether or not a company outsources any of its R&D, IS also plays a key role in improving the synergies between R&D and other corporate functions, such as manufacturing or sales and marketing.

DuPont's Morneau views R&D as a supply chain of processes

and new products. "The solutions that come out of research need to be integrated into the manufacturing supply chain," he says. IS brings the R&D and manufacturing together by ensuring consistency of information across both groups.

For example, DuPont scientists need to specify the denier, or fineness of threads, in nylon, which is used in various compounds DuPont makes. Since denier can be measured several different ways, Morneau makes certain R&D scientists and manufacturing folks are speaking the same language when they share information.

The same holds true for the link between research and sales and marketing, says Morneau. A salesperson may meet with a research scientist to see if DuPont could address the needs of a customer by producing a chemical with a certain melting point, for example. Before that conversation takes place, the two sides must spell out how they're defining "melting point." Here again, IS is the great information equalizer, ensuring standard definitions are used in documents wherever possible and nonstandard terms are clearly defined, says Morneau.

In the pharmaceutical industry, maintaining standards throughout documents can be a matter of life and death, says Peltzman. If a document created in R&D specifies a milligram dose but the word milligram is accidentally converted into microgram when that document gets sent to sales and marketing, the result could be horrific. "IT staff in all parts of the organization need to understand the business impact of maintaining compatibility," says Peltzman.

—L. Gibbons Paul

research is not a product in the traditional sense. Although executives naturally want to protect their companies if things go wrong with the arrangement, they must resist the tendency to be too restrictive in the contract. "You don't want to stamp out innovation," says ADL's Boghani. "You're not buying a product; you're buying research. You have to have certain provisions in the contract, but you don't want to make it too narrow."

Executives cite other potential pitfalls of the outsourcing arrangement:

INTELLECTUAL PROPERTY ISSUES.

Ownership of the copyright or patent on the material developed by the outsourcer is decided by an agreement between the parties, not by statute, leaving a lot of room for error, says Sharp's Clemens. "In general, the company spending the money wants to keep control of the intellectual property," he explains. Although he's never experi-

enced it himself, Clemens says he's seen this type of agreement go sour, and it can get ugly. "We've learned to be very careful about spelling out who keeps what," he says.

Contractual language is especially important because the outsourcer will almost certainly work on future projects that leverage the expertise it developed for your company. Says Bellcore's Personick: "The problem is, you cannot precisely define what is appropriable expertise and what is more generic expertise. Companies wish they could leverage all the expertise the outsourcer gained by working for other customers, and then they wish the [outsourced researchers] would retire and never work for anyone again."

Personick calls this the ultimate trade-off of contract research. Business executives must decide whether the benefits of the arrangement outweigh the downside of sharing intellectual property with

the outsourcer's future customers. One thing is certain: Any company considering outsourcing R&D should hire an excellent intellectual property lawyer who can navigate these rocky waters.

MANAGEMENT ISSUES. Especially when long-term, exploratory research is at stake, managing an outsourcing project can be a hassle. Clemens recommends making sure the interpersonal chemistry of the teams—internal and external—matches prior to the agreement, since so much rides on the relationship. He prefers not to have day-to-day contact with the outside research team and has faith the work is getting done without the need to micromanage.

Others favor more frequent contact to ensure the external team stays on track. Keeping in touch with the outside team is an ongoing, daily task, says BellSouth's Kettler. "Ideally, you'll blur the line of demarcation between the two groups. If you can have the teams co-

RESEARCH AND DEVELOPMENT

located, that's a plus."

To get payback on a project, client companies must be as committed to the outside project as the outsourcer. "The customer must play a role in managing the research," says Bellcore's Personick. He has had client contacts "go away" through a corporate reorganization or downsizing. That situation, while common, constitutes a major red flag for the project because it indicates the outside team cares more about the project than does the inside team. At that point, the external project manager takes a trip up the corporate client's hierarchy in search of a new sponsor to lead the project. "I'd rather change course several times than produce a useless pile of paper," says Personick.

ADL's Boghani concurs. "These projects are hell to manage. You have to clearly identify milestones, accountabilities and expectations. It's pretty common to lose touch with the outside team," he says.

WHOM DO YOU TRUST? The client company has a lot riding on the outsourcing research arrangement. Picking the wrong outsourcer could result in a failure to develop key technologies and thus lost competitive advantage. That



Staffing Up: BellSouth VP of Science and Technology David Kettler uses outside researchers to meet peaks and valleys of demand for R&D.

pressure can make choosing a research partner very difficult, especially if it's the company's first foray into contract R&D. Companies must exercise cau-

tion, says Sharp's Clemens. "Don't try something critical with an outsourcer you haven't used before."

ADL's Boghani recommends asking industry associations for a list of potential suppliers. "You have to do very good due diligence. If the initial selection is done well, the rest will fall into place," he says.

Your in-house scientists should have a good idea of what kind of work various research organizations are doing. Use your scientists' expertise as a resource when you are picking partners. After you've narrowed your list, common sense dictates interviewing—in person, if possible—a good selection of each potential outsourcer's clients.

Research is always risky business, whether done internally, externally or both. But it's a risk companies must take to stay in the game. "The most expensive thing that can happen to a company is to be late to market," says SRI's Sommers. **CIO**

Lauren Gibbons Paul is a freelance writer based in Belmont, Mass. She can be reached at lauren paul@sprintmail.com.

Taking It Outside

Tips for outsourcing R&D agreements

Managing outsourced research agreements can be tricky, says Jon Clemens, president and CEO of Sharp Laboratories of America Inc. in Camas, Wash. Here are his tips on managing contract research projects:

- Make sure intellectual property matters of copyright, trademark and patent are spelled out explicitly in an agreement before work commences.
- Sketch out project milestones and expectations—and keep in close enough contact to ensure these will be met.
- Don't lose touch with the outsourcer. The outside team needs constant guidance and feedback to produce useful results.
- Don't be too strict when it comes to setting late penalties. Success is more important than principle.
- Don't be afraid to trim a project or change direction in midstream. It's far more effective to adjust your portfolio than to stick to a primrose path.
- Make sure there's personal chemistry. Don't partner with people you don't like.

—L. Gibbons Paul

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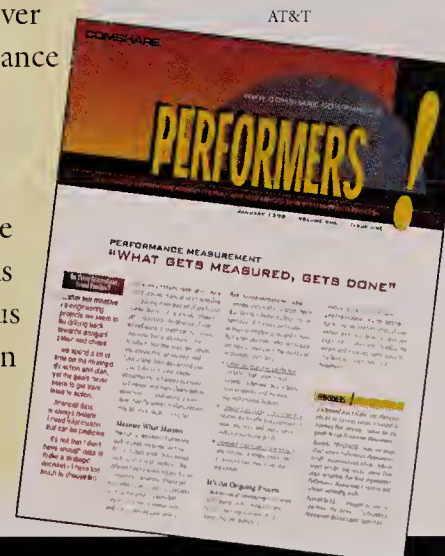
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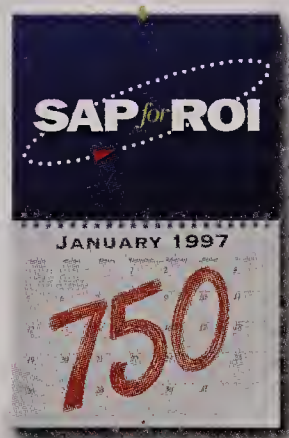
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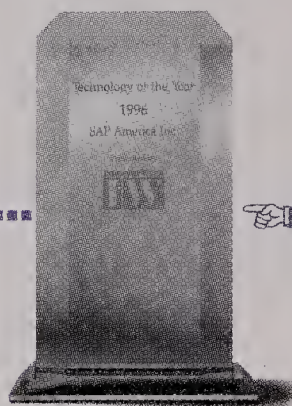
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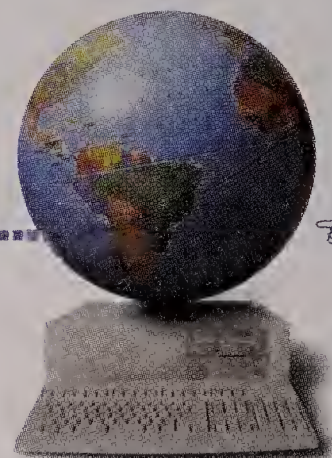
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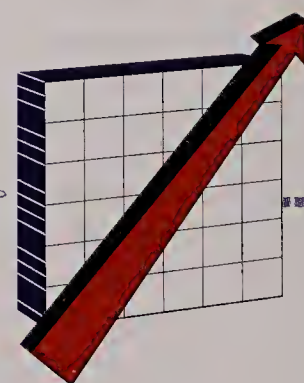
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25,000 Motorola employees go live with the R/3 HR and Payroll applications, establishing a foundation for managing employee information worldwide.



1997

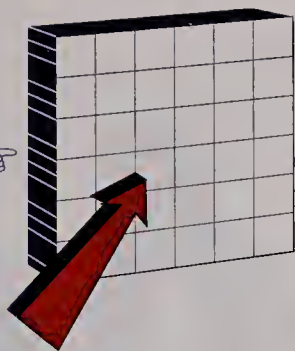
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1997

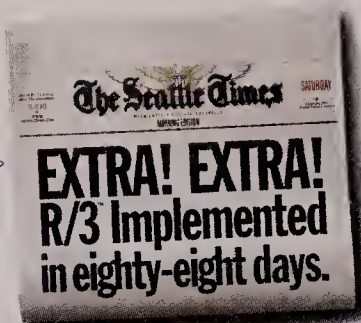
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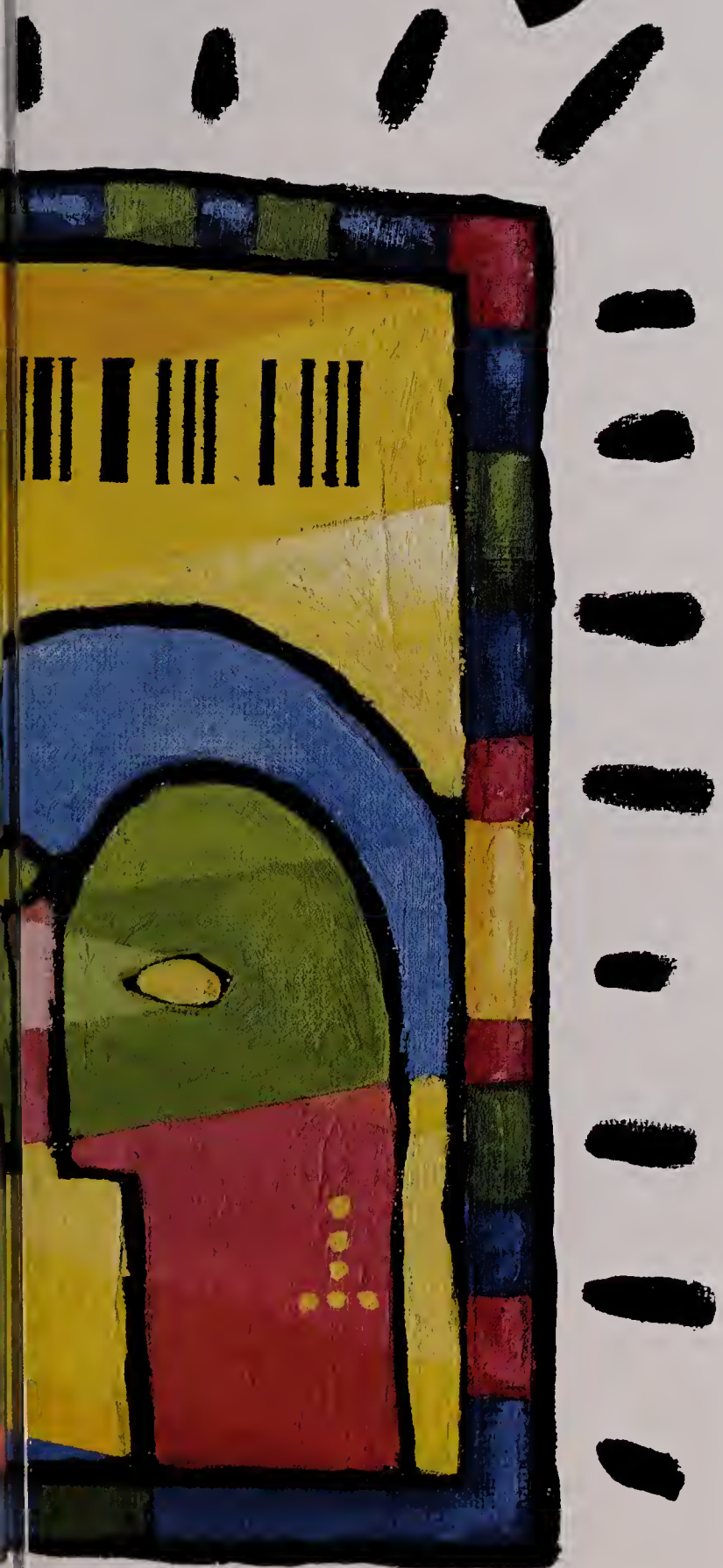


ILLUSTRATION BY RICHARD COOK

Of all the pressing issues on Pete Janak's mind

early last year, the unified currency in Europe was not one. Then he heard a wake-up call. Flying to London to meet with other CIOs in January 1997, Janak expected year 2000 programming issues would consume most of the conference room oxygen. The CIO of one of the nation's largest automotive and defense manufacturers was astonished to find his colleagues abuzz over Europe's forthcoming Economic and Monetary Union (EMU) and its currency, the euro.

The European Commission (EC), the governing body of the European Union (EU) that oversees EMU, had fixed Jan. 1, 1999, as the euro's launch date, and the CIOs at the conference were anxiously assessing IT implications. Companies conducting business within or with Europe—virtually the entire Fortune 500—would have to rewrite billions of lines of code. Reprogramming information systems wouldn't require rocket-science genius, but the effort would cost \$150 billion to \$400 billion worldwide, according to Nick Jones, director of research and a vice president at Gartner Group Inc. in London. And nobody could anticipate how the new code would work in the interconnected systems that run the global economy. Making matters even more difficult, the European Commission had yet to nail down the specifications of the systems architecture.

Janak was not alone in his innocence. Awareness of the euro was low in the United States, where strategists, neck-high in year 2000 issues, regarded the currency change as a highly uncertain European affair. Upon his return, Janak tried to rouse his TRW Inc. colleagues. "I came back and said, 'Hey, we may be having a problem with this euro thing.'" But, he says, "Their reaction was, 'Oh geez, those guys will never make that date anyway. There won't even be monetary

If you thought the year 2000 problem was your only IT worry, think again. A new currency brought to you by a unionized Europe may very well rock the business world and your company's IT systems.

BY LYNDARADOSEVICH

Reader ROI

FOR U.S. MULTINATIONALS, THE EURO'S IMPLICATIONS ARE difficult to specify but too large to ignore. Few American companies have started to ready their business and information systems to work with Europe's new currency, but now is the time for executives to

- ▶ Determine the strategic importance of your business dealings with Europe
- ▶ Assess your IT group's ability to deal with the new currency
- ▶ Plan to take advantage of Europe's unified market

INTERNATIONAL BUSINESS

union.' We were kind of hoping it would slide a little bit."

Eventually, Janak did persuade TRW executives to look at the euro issue more closely. Unless the Cleveland-based company is willing to risk its \$3 billion in revenues that originate in Europe, TRW must accommodate EMU, says William L. Aamoth, assistant treasurer, international. Now a full-time project manager is helping business unit and IT managers anticipate the euro's impact on processes as wide-ranging as finance, customer support, human resources and marketing.

If all goes according to plan, this May the EC will determine which member countries meet the economic criteria for joining EMU in 1999. Most likely, Austria, Belgium, Finland, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain will form the core group, and the United Kingdom, Denmark, Greece and Sweden may join later. In January, the EU's new European Central Bank will fix the exchange rate between the euro and each participating country's currency. Those countries will use the euro in large financial transactions. From 1999 through 2001, organizations in EMU countries may use either their domestic currency or the euro as their primary currency, and on Jan. 1, 2002, the European Central Bank plans to introduce euro bills and coins for retail use. Three to six months later, participating countries will withdraw their local currencies, and the euro will stand as EMU's only currency.

As it turns out, the euro is not just a European affair. Like TRW, U.S. companies are realizing they must prepare to deal with it. Economists expect EMU will rival the United States for economic and financial dominance, and the euro will challenge the U.S. dollar and Japanese yen as reserve currencies in

Several quirks make euro computations more complicated than traditional currency conversions. EC requirements that dictate conversion calculations to six significant figures—1.92573 deutsche marks or 1906.48

Italian lire, for instance—present problems for many systems. Furthermore, results may be rounded up from .005. That standard defies, for example, Italian convention: The lira is such a tiny unit of currency that Italy rounds down from .99. The conversion is also complicated by EC rules that will require companies converting to or from an EMU participant's domestic currency to convert first to the euro and then to the target currency. Financial systems don't currently support that unique triangulation process.

Even systems that can bill and track payments in several currencies cannot necessarily support more than one base currency. During the transition, divisions operating in EMU countries may have to conduct business using two or more base currencies in order, for example, to run reports in euros for their company's European central management and in the domestic currency for the host country's reporting requirements.

"One belief is that if a system handled multiple currencies, ipso facto, it handles the euro. That's not so," says Sarwar A. Kashmeri, president of Niche Systems Inc., a financial systems consulting firm in New York City. He reports that financial applications from such vendors as SunSystems Inc., Great Plains Software Inc., Solomon Software Inc. and Scala Inc.

By Definition

Euro: Nickname for the common currency of the upcoming European Economic and Monetary Union. Starting in January 1999, EMU will comprise about a dozen countries of the European Union.

Are You Euro Ready?

To prepare for the euro's far-reaching implications, you should

- **Determine your current level of European business.** You need a euro policy if 20 percent or more of your revenues come from Europe or if your European business is strategically important.
- **Ascertain when your European customers will convert to the euro.**
- **Examine your financial systems.** Can your systems accommodate another currency and triangulation? Are your systems easily upgraded?
- **Evaluate human resources systems, including benefits, pensions and compensation.** Will contractual arrangements require you to pay some employees in local currencies and others in euros during the transition?
- **Inspect contracts.** If contracts that stipulate payment in domestic currencies extend beyond 2002, do the contracts remain valid once domestic currencies expire?
- **Examine logistics, supply chain, warehousing and shipping applications.** Will the unified market change supply flows, and can you adapt them to reflect changes?
- **Establish a conversion timetable for making your IT systems compliant with the new currency.**

SOURCE: HURWITZ GROUP INC.

global trade. Replacing as many as 15 European domestic currencies and unifying a huge marketplace, the euro will affect legal contracts, financial management, sales and marketing tactics, manufacturing, distribution, payroll, pensions, training, taxes and, of course, information systems. "I don't think there's a system here that goes unaffected. It's very similar to year 2000 but with more variables," says Jim McGuire, a national managing partner for KPMG Consulting in Stamford, Conn.

don't support multiple base currencies.

In light of those challenges, it may seem almost trivial to mention that PC fonts don't support the euro symbol, and programmers will have to install keyboard shortcuts to accommodate it. But the task will be far from insignificant. Gartner Group predicts that updating end user applications and preparing keyboards will cost from \$147 to \$745 per PC.

The EMU doesn't exist yet, and many variables remain

unknown. There is no guarantee that even the 11 likeliest candidate countries will join. And to compound the confusion, each EMU member will individually determine the date by which it will require tax returns in euro. There is but one certainty: The euro will not affect all U.S. multinationals equally.

Because Logistix has no major divisions in EMU countries, it will need only one base currency. The Fremont, Calif., company that distributes and fulfills orders of CDs, floppy disks and documentation for brand-name software vendors operates its European distribution hub in Dublin, Ireland. Logistix is considering letting buyers pay their bills in euros right from the start, and its bank will convert payments to U.S. dollars for deposit. Logistix will record euro transactions in its accounts receivable program, using euro-compliant R/3 updates from SAP AG. Logistix is prepared to issue euro packing slips and invoices that address triangulation and rounding requirements in mid-1998.

For companies with large divisions and major customer bases in several EMU countries, the euro's impact may be more complex. With 70,000 employees in Europe, IBM Corp., for instance, generates voluminous business from customers in every European country. For nearly two years, IBM has been wrestling with euro issues, and already the company has devoted 500 people to the transition at least part time.

"The euro percolates into every single corner of the business," says Peter Cruttenden, leader of IBM's internal euro project based in Paris. IBM's EMU project is split into six areas: customer requirements and opportunities, customer service offerings, internal business processes and IT systems support, implications for IBM products, communications covering customer and employee awareness, and a project to study the implications of individual governments' approaches to the transition period.

Two main considerations will determine when IBM converts to the euro: its customers' plans and its internal reengineering timetable. If IBM moved before its customers, they would be obliged to translate IBM's invoices, purchase orders and other statements to domestic currencies compatible with their systems. By the same token, IBM can't lag behind its customers.

Meanwhile, IBM is reengineering its business practices, installing new client/server systems and coming to grips with year 2000 compliance. It would be wasteful to convert legacy code to the euro only to replace it with new systems a couple of years later.

So starting in January 1999, the company plans to accept payments and invoices in euros, but its divisions will continue to use local currencies for internal operations such as accounting and external documents such as contracts, proposals and invoices. For the next two years, IBM's banks will convert euro payments to the local currency of each subsidiary's account. To track euro payments, IBM will make small coding changes to its accounts receivable programs. Current plans call for its divisions in EMU

countries to convert such internal systems as invoicing and reporting by Jan. 1, 2001. At that time, the company will shift all operating files to euros, and to support comparative analyses, it will convert certain historical data as well. That most extensive phase of the change, Cruttenden says, will affect 80 percent of its applications over a number of years.

Because money is their business, international banks will feel the euro's impact intensely and immediately. Wall Street banks must be ready to buy, sell and trade in euros by next January. Bill Irving, a partner in charge of capital markets consulting at Coopers & Lybrand LLP in New York City, estimates that each major bank will spend an average of 1 percent to 3 percent of its annual operating budget—\$20 million to \$50 million—to reprogram its information systems.

Beginning next Jan. 1, European stock exchanges will quote all equities of EMU nations in euros. Accordingly, banks like New York City-based J.P. Morgan & Co. Inc. will buy and sell those securities in euros. And because EMU candidate nations intend to restate outstanding government debts that same day, J.P. Morgan will, over the new year's first weekend, convert government bonds to euros that are on today's books in such

Financial Assistance

Software vendors are supporting the arcane demands of the euro

■ **SAP AG, Walldorf, Germany, www.sap.com.**

SAP officials say R/3 Release 3.0 and higher support the European Union's conversion rules and multiple base currencies in all modules. With Release 4.0, due out by May, R/3 will include tools that convert local currency accounts to euros as well as add-on functions that let customers generate price lists or submit reports in both euros and national currencies. Those conversion tools will also be available for R/3 Release 3.1. The company will offer euro-conversion support services this spring.

■ **Oracle Corp., Redwood Shores, Calif., www.oracle.com.**

With Oracle Applications Release 11, due to ship in April, Oracle will support multiple base currencies in all Oracle applications modules. Release 11 will incorporate euro conversion, tools for converting local currency accounts embedded in applications, and such dual-currency support as the ability to generate price lists in euro and local currencies simultaneously. The company already offers euro-conversion support services.

■ **PeopleSoft Inc., Pleasanton, Calif., www.peoplesoft.com.**

Since November 1996, when PeopleSoft shipped Release 6, the company says it has supported multiple base currencies in the assets and general ledger modules. Release 6 also supports such dual-currency functions as price list and report generation in both euros and local currencies. Release 7.5, due to ship by July, will update accounts payable and accounts receivable modules to support multiple currencies.

—L. Radosevich

INTERNATIONAL BUSINESS

local currencies as deutsche marks or francs. When the bonds are multiplied by the euro exchange rate and calculated to six significant figures, the results will include decimals. Some governments will keep the bond values in decimals, while others like France will have their euro bonds stated in whole numbers, settling the difference with the banks, notes Susan M.

On the Money

The following North American industries have major operations in Europe and will most keenly feel the impact of the new European currency:

- Financial services
- Automotive
- Pharmaceutical
- Telecommunications
- High-technology
- Consumer goods and food
- Airlines and other services

SOURCE: COOPERS & LYBRAND

Kirchhoff, a vice president and global EMU program director for J.P. Morgan. For instance, while the actual conversion rates won't be set until Dec. 31, 1998, a 1 million French franc bond might convert to 166,854.10 in euros. The French government would "cash out" the 10 euro cents, meaning it would pay the difference to the bank. The company will need to write code that will convert redenominated stocks and bonds—as well as its historical data—to a

common currency, but it has yet to decide whether that currency will be euros, deutsche marks or a synthesis of EMU currencies.

J.P. Morgan has been analyzing the business implications of the euro for years but began serious work on its infrastructure in the first quarter of 1997. Kirchhoff says the bank's divisions are devising detailed technical specifications and some have begun writing code. To ensure next January's conversion goes smoothly, the bank will test general ledger and cash systems across all the business units during this year's third and fourth quarters, and it will run several mock conversion weekends.

While most U.S. companies are ahead of their European counterparts in preparing for the year 2000, they lag behind in euro-readiness. "Outside of high-tech and finance, where there's a real imperative to pay attention, there's not much awareness of this issue at all," says Joshua Greenbaum, a senior consultant and director of the packaged software strategies service at Hurwitz Group Inc. in Framingham, Mass. Greenbaum, author of a study on the euro's implications for American business, says, "It's somewhat typical of American companies and their attitude toward Europe in general."

Some executives simply hope the euro issue will just dissolve before they have to deal with it. "The firms I work with are operating on the assumption that the Europeans are going to wake up sometime in the next 12 months and realize that

the euro thing is doomed," says Edward Yourdon, chairman of the Cutter Consortium, an Arlington, Mass., advisory service that focuses on year 2000 issues. "So they're doing their best to avoid spending any money on the euro project."

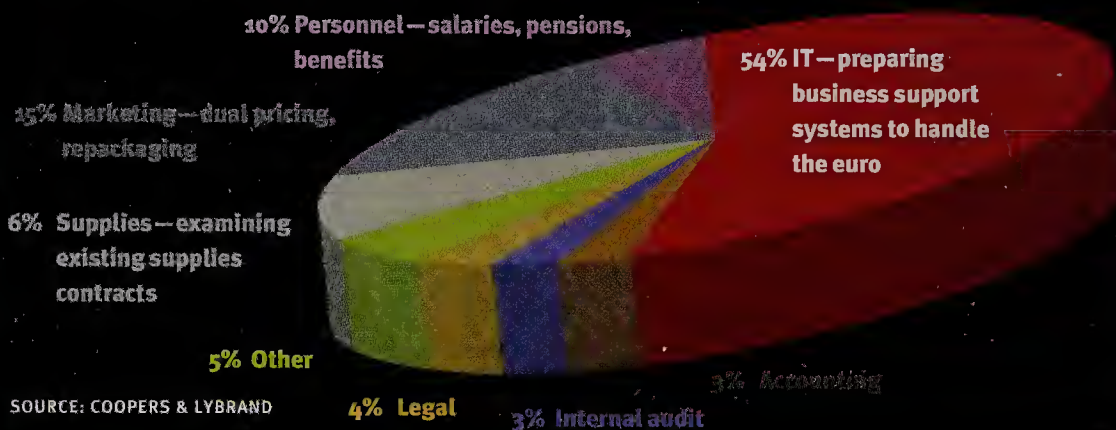
Most experts, however, have no doubt that the EC will launch EMU and its euro currency as planned. They anticipate a unified market that facilitates corporate comparison shopping among suppliers in different member countries and allows products and supplies to cross borders without incurring the costs of currency conversion. Companies may save money by consolidating warehouses and manufacturing plants, and corporate treasurers expect the single currency to reduce the need to hedge—offset risk by buying or selling currency futures or options—when economic conditions are unstable. "The currency fluctuations were driving our people batty.... We're all for the euro because it will simplify things greatly for us," says Supreet Manchanda, CIO at Logistix.

Because their home currency won't change, American businesses have more breathing room than their European counterparts. But IBM's Cruttenden cautions against sticking the euro on a back burner. "You have to start with the assumption that it's going to happen on time and it's going to be a big deal when it happens," he says.

TRW, it turns out, is nicely positioned to greet EMU. Back in 1996, the company initiated a five-year rollout of SAP R/3 packaged applications. Now, in light of the software's euro capabilities, management is giving consideration to an accelerated implementation, and Aamoth views the new order with considerable optimism. "Foreign exchange will get easier as you no longer have cross-currency exchange risk. Banking should become more competitive because the industry may

The Costs of Making (the) Change

It costs plenty to prepare a company to transact business in euro-based economies, but IT support systems eat the largest slice by far.

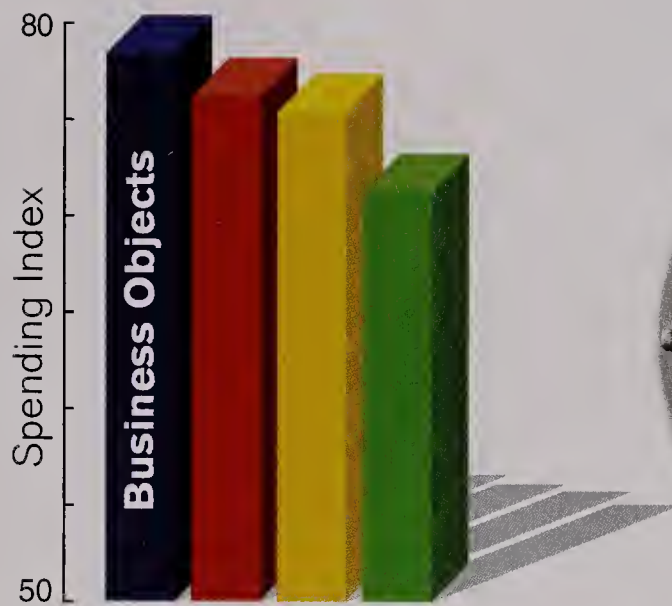


consolidate. And prices you pay for certain banking products will go down. Those are all good things for us." **CIO**

Lynda Radosevich, a senior editor at InfoWorld, can be reached via e-mail at lynda_radosevich@infoworld.com. For more on the euro, see "Uneasy Money," Sept. 1, 1997, CIO, or visit www.cio.com/archive/090197_global.html.



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Complexity theorists
Birute Regine and
Roger Lewin believe
that the unpredictable
behavior of a flock of
birds holds valuable
lessons for managing
organizations.

PHOTOGRAPHY BY FURNALD/GRAY



Simple, Yet Complex

Supporters of complexity theory believe that the secret to a more creative and productive workforce lies in some simple rules of nature

EXECUTIVES WHOSE BUSINESS SCHOOL curriculum failed to include old episodes of *Mutual of Omaha's Wild Kingdom* may gain a new appreciation for Marlin Perkins—as management guru. A growing number of consultants and academics are looking at complexity theory, once the domain of the biological and physical sciences, to help managers improve the way they lead organizations.

What is complexity theory?

One way to understand it is to look skyward to the avian maneuverings of birds. A lone bird follows simple rules of behavior, such as when and what to eat. However, a group of birds flying together exhibit complex, unpredictable, creative behaviors that emerge naturally from the interactions of individual birds. For example, a flock in v-formation is able to fly farther and

faster than an individual bird. The flock that is formed when autonomous agents—birds—interact is known as a complex adaptive system. To fly in a flock, a bird need follow only three simple rules: Don't bump into anything, keep up and stay in close proximity. Yet following these rules leads to a cohesive, seemingly complicated group of birds flying with the speed and precision of the Blue Angels.

Complexity theorists argue that man-

agers should allow creativity and efficiency to emerge naturally within organizations rather than imposing their own solutions on their employees. They can do this by setting some basic ground rules and then encouraging interactions or relationships among their employees so that solutions emerge from the bottom up. Managers can't predict what the solutions will be. But just as a flock of birds can achieve

more than a bird flying solo, it's likely that the energy and enthusiasm that are unleashed when employees are working together will yield successful results.

Several researchers and companies are examining how an understanding of complexity theory can apply to businesses. Roger Lewin and Birute Regine are two researchers making headway in this area. Lewin and Regine have backgrounds in biology and psychology, respectively, and Lewin has written several science books, including *Complexity: Life on the Edge of Chaos* (Collier, 1994). They are currently collaborating on a book about complexity theory called *The Soul at Work: Complexity Theory*

and Business, As If People Matter (to be published in January 1999 by Simon & Schuster). "With the Internet and networks, the extent of business ecosystems is growing," says Lewin. "And the pace at which the landscape within an ecosystem changes—thereby forcing changes throughout—is increasing." That's why Lewin and Regine believe today's business climate is particularly ripe for the application of complexity theory.

Recently, Features Editor Megan Santosus spent an afternoon discussing complexity theory and its implications with Lewin and Regine at their Cambridge, Mass., office.

Reader ROI

A NEW MANAGEMENT THEORY is gaining momentum in the business community. In this story you will learn why complexity theory encourages executives to

- ▶ Discard the traditional command-and-control style of management
- ▶ Develop relationships among their employees to ensure a creative and productive workforce
- ▶ Maintain a strong vision for their companies yet manage with a hands-off approach

BUSINESS MANAGEMENT

CIO: How do you define complexity theory for business people?

Lewin: There is no simple definition of complexity theory. Traditionally, business people think about their worlds in a very mechanistic, linear way that is [characterized] by simple cause and effect and is predictable. Most of the world isn't like that.

Complexity theory looks at these systems in ways that are organic, nonlinear and holistic.

CIO: What are the principles of complexity theory?

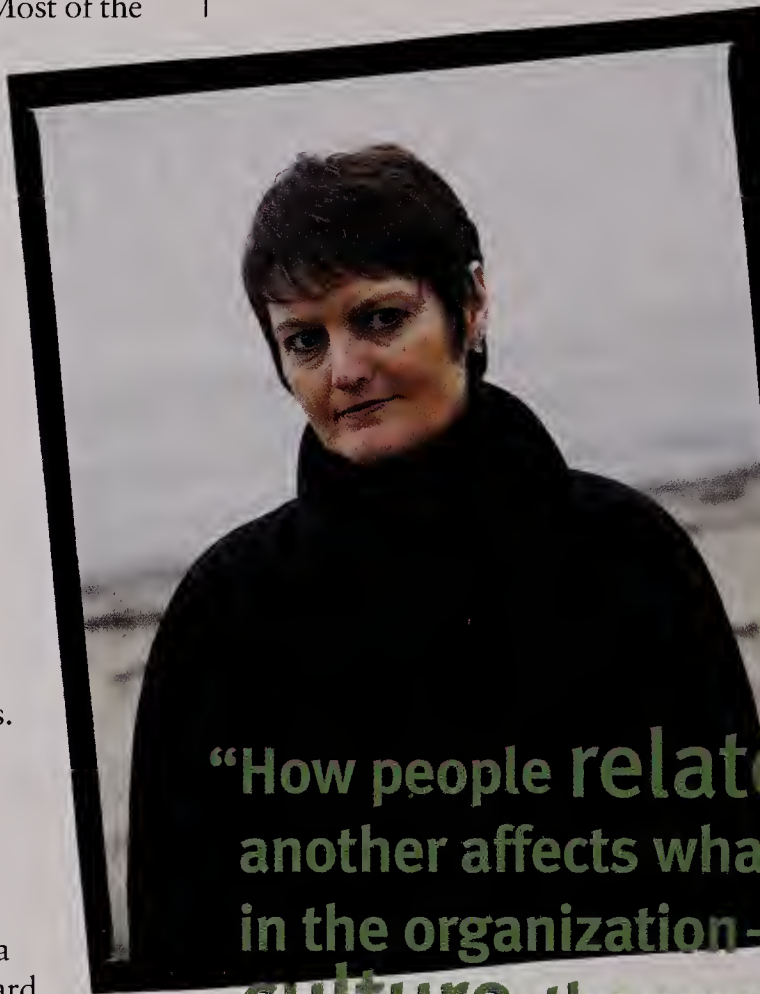
Lewin: A few simple rules guide the interaction between the components of a system. First, in a business context, managers should attend to relationships at all levels within their organizations. The second rule is that small changes can have large effects. And third, interesting and unpredictable properties can be expected to emerge from a system. As a result, it is hard, if not impossible, to implement a strategic plan for anything but the short term. A hoped-for direction can be set but not the ultimate goal.

Regine: People often think of complexity theory as a metaphor. We certainly don't think of it like that because that is like saying it's just another fad. What we're saying is that underlying principles found in nature apply to human organizations.

CIO: So how does this organic way of looking at things apply to businesses and other organizations?

Regine: It gives them a different way of looking at their organizations. Take the property of emergence, for instance. In computer models based on complexity theory, when autonomous agents interact and mutually affect one another, patterns

will emerge—an intrinsic order just waiting to unfold. But it comes about in a nonlinear way, so the order can't be predicted. When we translate computer models into human terms, the autonomous agents are people and the interactions among them are relationships. Complexity theory



“How people relate to one another affects what emerges in the organization—the culture, the creativity, the productivity.”

—Birute Regine

underscores the importance of relationships. How people relate to one another affects what emerges in the organization—the culture, the creativity, the productivity.

So if you want a culture that is intrinsically creative, growing and learning, you have to look at the relational level: Can people be real with one another? Is there trust? Do people acknowledge each other and the good work they do? In organizations that have relationships as their bottom line, a culture of care and connection emerges—and it is palpable. In this context, people are more willing to change and are more adaptable because they feel they're not alone and that together they can manage most anything.

CIO: It sounds like complexity theory flies in the face of traditional problem-solving techniques.

Lewin: The idea of teamwork has been popular, for instance, partly because managers believe that people are happier as members of teams but also because teams can be highly effective in the workplace. The traditional approach to [implementing a team structure] would be for managers to say, “OK, we're going to make you a team,” and to expect everyone to fall in with the idea. This can work, but from what we hear, it often doesn't work very well because it is imposed and artificial. When managers genuinely value relationships in the workplace and truly listen to people and act on their suggestions, a culture of care and connection emerges in which people are highly responsive to the needs of the organization. Teams can form spontaneously and powerfully in this

context, and the job gets done. It's much more effective to allow solutions to problems to emerge from the people close to the problem rather than to impose them from higher up.

CIO: Do you know of any organizations that have used complexity theory to solve problems?

Regine: At Muhlenberg Regional Medical Center in Plainfield, N.J., it took up to 24 hours to admit patients and give them their first dose of antibiotics. [The hospital] used a complexity approach—[implementing] small changes and bottom-up solutions, then allowing things to unfold—to solve the problem. The vice president of nursing put together a diverse team of people—secretaries, doctors, administrators—to try different things, to experiment, to make small changes and see how they could reduce the wait. First they tried having all the admissions procedures

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BUSINESS MANAGEMENT

done in one place. Then they looked at duplication of services. One thing led to another, and within only four or five months they had reduced the admission time to one hour. No one could have anticipated that the new way of doing admissions would have emerged so quickly and so efficiently.

CIO: *How does complexity theory apply to strategic planning?*

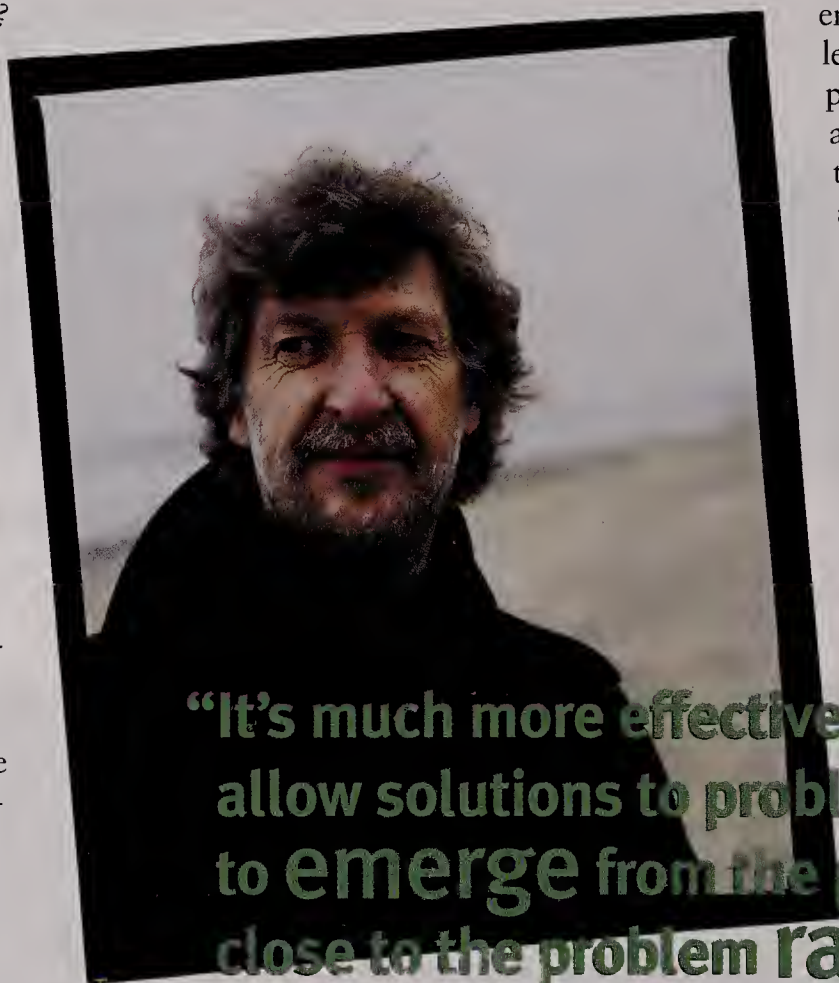
Regine: Everybody knows that in most industries long-term strategic planning is near impossible, and this is often viewed as a failure on the part of management. When you recognize that the business environment is a complex system that is inherently unpredictable, you understand that the failure of long-term strategic planning is not a failure of management but an expected outcome of the business environment. The challenge for managers is to feel comfortable merely setting the direction for the future and to be ready to adapt and evolve as the environment changes.

The Industrial Society, a London-based business consultancy, was on the brink of financial collapse three years ago. A new CEO was brought in, and he said, "Forget about a strategic plan. The first things to get right are the relationships among top management." He then asked the workers in the lower levels of the organization what they thought they could achieve in their wildest dreams. Some responded with wildly unrealistic profit targets—and many were met. The energy tapped was incredible because a project was available for anyone who wanted to participate [on a team], whether it was a secretary or top manager. The company is now financially healthy.

CIO: *Traditional consultants who are in the business of providing solutions*

may find themselves at odds with complexity theory.

Regine: Many consultants often get in the way of emerging solutions because of their need to prove they have answers. There is a role for consultants, but it's a very different kind of role and leadership.



"It's much more effective to allow solutions to problems to emerge from the people close to the problem rather than to impose them from higher up."

CIO: *How should the role of consultants change?*

Lewin: Of course, corporations will always need consultants to go in and fix many operational problems, such as line scheduling. But when you are dealing with organizational issues, particularly those that require change, it's appropriate to consult in a different way. A complexity theory perspective is particularly helpful to disheartened, disconnected companies where workers lack commitment—rather, they just watch the clock and work to pick up a pay check. For instance, a big steel-making company

in Australia was having terrible industrial relations problems, with workers and managers battling each other.

Not surprisingly, productivity was way below its potential. Consultants went in and simply got people talking to each other. Before very long, these big, muscular Aussies were building relationships with each other.

Workers and management began to empathize with each other's problems. And productivity went up 20 percent. The consultants didn't have a strategic plan to increase productivity by a certain amount. They attended to relationships, as the complexity approach says, and the productivity enhancement followed.

CIO: *Wouldn't the role of executives have to change as well?*

Regine: CEOs and CIOs are used to thinking that they have to have all the answers, that they are in control of everything. Well, control

is not something you can have over a complex system, at least beyond some very general parameters. So yes, executives do have to change. They have to give up the illusion of control and concentrate instead

—Roger Lewin

on setting a larger vision for their organizations so that the creativity of their people can emerge.

Lewin: It's not about saying let's look at business organizations as if they are complex systems. They are complex systems. Managers have been operating within them in a very controlling way, which dampens the potential creativity of employees. What we're saying is shift the way you [lead] organizations, loosen control to encourage more creativity. A culture of care will emerge, as opposed to a culture of command and control, and your company will be more creative and productive, too.

CIO: What are the qualities executives need in order to be successful in a complexity environment?

Regine: Be accessible, respond immediately to others, acknowledge and value people's contributions at all levels, create opportunities for people, take the time to build trusting relationships and walk the talk—you are the embodiment of the organization's values. If you can't be honest, then how can you expect others to be? [Wouldn't dishonesty] affect the culture, the organizational identity and how you develop relationships with other organizations? It all starts with you.

CIO: Are there any qualities employees need to have in a complexity environment?

Regine: The people on the front lines have to conquer the fear of freedom that comes when they are given the

leeway to do something important.

CIO: What about organizations? Are there particular qualities that characterize a complex adaptive system?

Regine: There's a tendency in business to focus at the macro level. One thing complexity theory says is that the most powerful processes happen at the micro level—the people, relationship dimension. [To initiate these processes,] start small, experiment, include others and promote a “just try it” environment. Set up a few simple rules, then let go. Small successes will [encourage] other people to start pilot projects, and a comfort with change will catch on.

Complex adaptive systems have three ways of functioning. There is the stable zone, in which the company is in a state of inertia, not responding to opportunities nor adapting to changes. However, stability is not

something to strive for because it leads to an unresponsive system. Then there is the chaotic zone, in which the organization is bouncing off the walls, haphazard, led by events rather than choices and overreacting. And there is a zone in between these two, the creative zone, which is the place to be—not so stable that [little] changes, nor so unstable that everything falls apart. There's a lot of fluctuation in the creative zone—ups and downs and paradoxes keep occurring. For example, leaders in complex adaptive systems need to be strong and have vision, yet they also need to be comfortable managing with a hands-off approach. Also, companies may know the direction in which they're moving, but they don't know exactly where they will end up. Creativity emerges from tolerating such ambiguity. **CIO**

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Demystifying IT

The IT Process Landscape can help clarify IT's value for those who pay the bills

BY CHARLES L. GOLD

THE CFO OF A FORTUNE 500 COMPUTER COMPANY had a problem. He had to slash a sizable chunk from the company's total budget. But when his eye scanned the IT department's line items, he winced. He could already hear the CIO's protestations that cutting the IT budget would be tantamount to cutting off the organization's lifeblood. And he knew the CIO was right. But how were they going to convince the CEO?

Fostering this enterprisewide understanding of IT is a critical part of a CIO's mission. At some banks and insurance companies, for example, IT spending accounts for nearly 20 percent of the operational budget. But the CIO must convince those who view IT as a "necessary evil" that such a mind-set is increasingly dangerous. The following model can help non-IS executives better comprehend the value of their IT investments.

The IT Process Landscape

SEVERAL YEARS AGO, ERNST & YOUNG LLP developed the IT Process Landscape as a business-process improvement tool. This tool enables top management to better understand how cuts—or investments—will affect the business. The landscape also provides a solid framework for analyzing the tradeoffs that are inherent in the IT planning and budgeting processes.

The CIO and CFO at this company decided to build their budget presentation around the IT Process Landscape, which breaks IT spending into three categories. They presented the chart at right to the senior executive committee to use as a basis for developing a sound IT plan.

How It Works

RATHER THAN LUMPING ALL I.T. ACTIVITIES TOGETHER, the landscape divides them into three categories:

■ **Ongoing Business Support:** The day-to-day operation and support of existing systems for activities such as payroll, billing, customer service and e-mail.

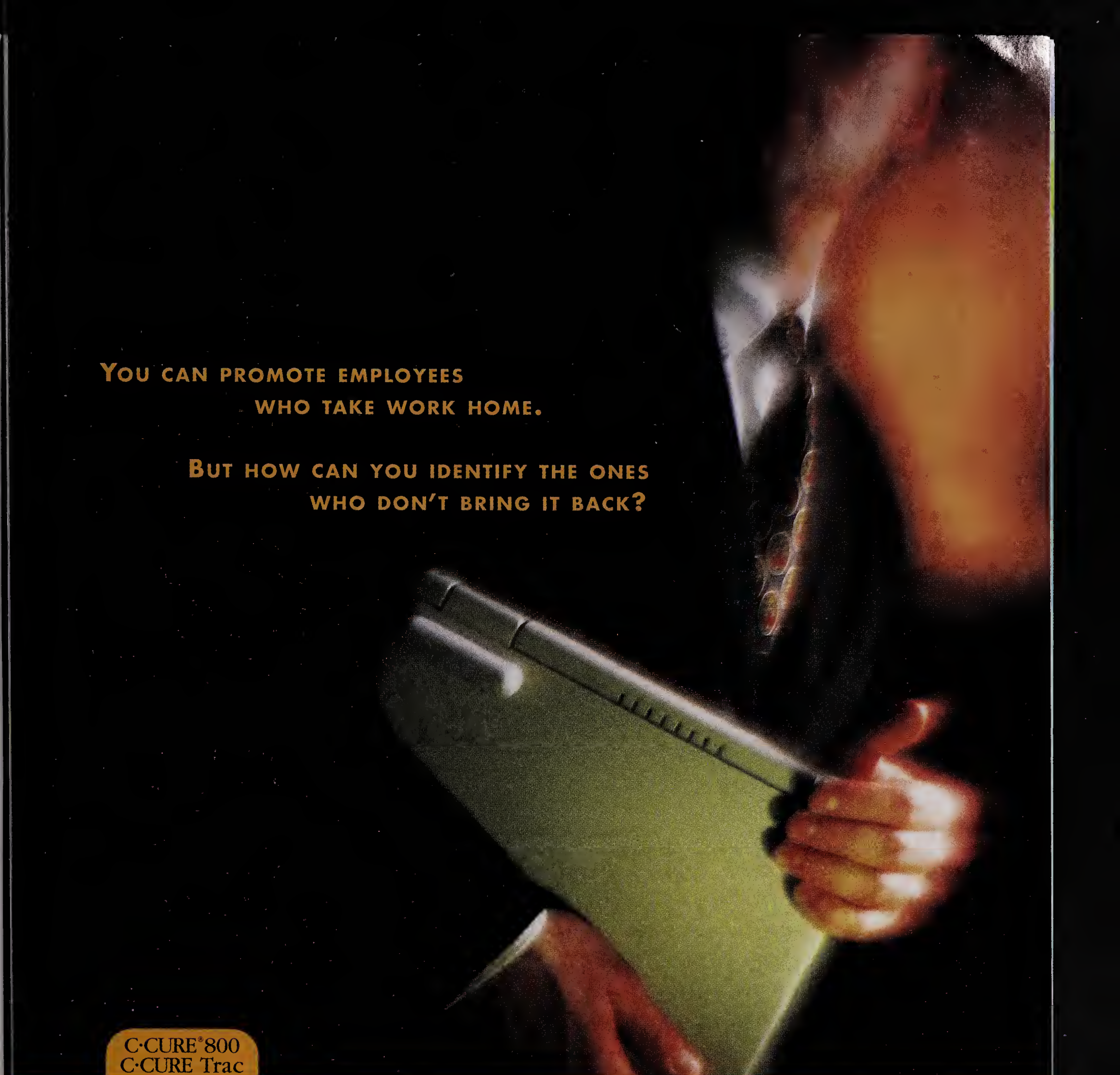
■ **Business Value Creation:** The identification and development of new IT-based systems and underlying infrastructure components that help create business value. For example, IT may be called upon to provide new systems for a company's business-process reengineering efforts or entry into new markets.

■ **Business Resource Management:** The management underlying a company's IT activities, including the salaries of the CIO, the IT architecture group and the IT financial planning group.

Each of the categories requires a different management approach. To understand why, it's useful to draw a parallel between the IT function and a manufacturing organization.



For example, ongoing business support is like basic production and distribution—it should be viewed from an operational management perspective with a focus on efficiently meeting required service levels. However, the business value creation element is like a manufacturer's product R&D division; budgeters should look at IT investments in this category in terms of what business benefit will be gained from the investment. And the business resource management element must be approached from a manufacturer's asset/capability management perspective. In other words, managers must make sure



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Checks & Balances

Map Your Company's IT Expenditures

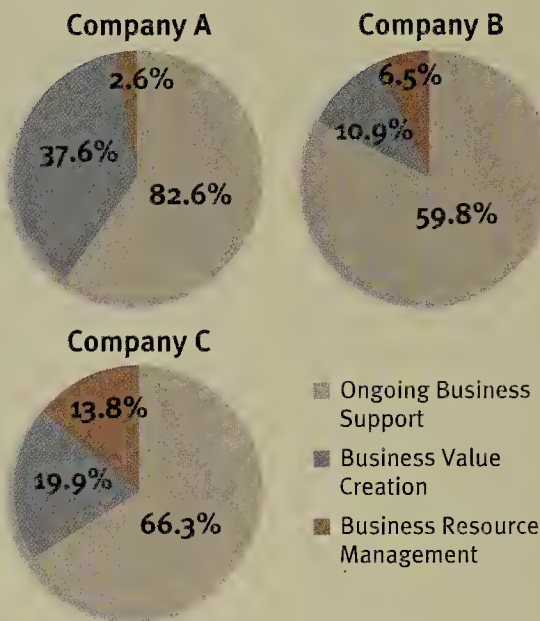
Do they reflect your strategic direction?

BREAKING OUT EXPENDITURES ACCORDING to the IT Process Landscape model provides a good basis for managing IT in a more businesslike way. As illustrated in the pie charts, which present data from three actual companies, IT allocations often vary significantly—reflecting each organization's specific business focus.

For instance, the major business-process reengineering efforts underway at Company A are reflected in its relatively high levels of spending in business value creation. On the other hand, Company B is a manufacturer striving to be a low-cost provider—so its funding for ongoing business support is much higher. After Ernst & Young completed this study, Company C decided that it was top-heavy in IT staff (as indicated by the high level of funding for business resource management), and it began reallocating staff to more hands-on activities.

—C.L. Gold

IT Activities as Percent of IT Budget



SOURCE: ERNST & YOUNG CENTER FOR TECHNOLOGY ENABLEMENT

that decisions made today will become assets, not liabilities, down the road.

Linking Business Drivers

LET'S ASSUME THAT THE MANAGEMENT team's interest has been piqued by the landscape. At this point, the landscape model gives you the opportunity to discuss the business dynamics that drive planning and budgeting.

To make such a discussion fruitful, the generic landscape framework should first be adapted to fit your company's way of thinking. At this particular company, the CIO and CFO changed the model slightly, dividing IT expenditures into five categories. They decided to allocate management salaries across the five chosen categories, rather than focus on business resource management as a separate category. These are the categories they created, followed by examples:

- **Ongoing Business Support:** Infrastructure support (network, e-mail)
- **Ongoing Business Support:** Current business-process operations (payroll, inventory, customer service)

■ **Business Value Creation:** Support for functional system changes (infrastructure, business processes)

■ **Business Value Creation:** Business-process reengineering projects (replacing old systems with new ones)

■ **Business Value Creation:** Competitive advantage efforts (pursuing new business opportunities)

Next, they told a story for each category. Each story had two focal points: the business driver for the activity (such as number of orders, number of lines of code) and the unit cost of meeting the need. Those two factors multiplied together determine the total cost for an IT activity.

The CIO and CFO found that linking activities to business drivers fostered a better understanding of IT's role and, ultimately, IT's budget needs. For example, the category of ongoing business support/infrastructure support sparked useful discussion of the department's workstation support activities. The business driver for the workstation portion of this IT budget item was the number of

employees needing workstations. Next, the costs of providing workstation support were analyzed. A study showed that the company's workstation costs were low compared with those of other companies.

However, they set a target for reducing costs further. Then, having established the business driver (number of employees in the selected work areas) and the unit cost of providing a workstation (the target chosen from the analysis), the level of the IT budget for workstation support became the product of the two factors. Using a similar approach for each category, an overall IT budget story was built until the whole picture emerged.

Once the CIO and CFO painted the picture, the interplay of business drivers and IT unit costs became clear. The senior business executives were able to discuss trade-offs intelligently and

make sound business decisions about IT. If unit costs were out of line with other companies' costs, they established targets and plans to reduce them. In some cases, they changed the level, or priority, of a business driver. For example, by dropping some requests for changes to existing systems, they were then able to shift more IT support into competitive advantage programs.

Interestingly, when the dust settled, the overall IT budget was larger than originally envisioned. The presentation had worked—management had come away with a greater understanding of the importance of IT's role. Equally important, the budget was more directly linked to the company's strategic goals. As the CEO of this company observed after the meeting, "I realize now that we can't just cut IT across the board. We need to think about each IT activity in an appropriate way. This presentation really helped me understand our options." **CIO**

Charles L. Gold, research fellow at the Ernst & Young Center for Technology Enablement, can be reached at charles.gold@ey.com.

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Index

Page numbers refer to the first page of the article(s) in which the company is mentioned. This index is provided as a service to readers. The publisher does not assume any liability for errors or omissions.

Company Index

3M Corp.	12
Arthur D. Little Inc.	44
Bell Communications Research Inc.	44
BellSouth Telecommunications Inc.	44
Business Evolution Inc.	12
Center for Project Management	30
Christian & Timbers Inc.	12
Computer Associates International Inc.	30
Coopers & Lybrand LLP	54
Cutter Consortium	54
Deltek Systems Inc.	30
Dragon Systems Inc.	12
DuPont Co.	44
Electronic Retailing Systems International Inc.	12
Elron Software Inc.	12
Ernst & Young LLP	68
Ford Motor Co.	26
Gartner Group Inc.	54
Great Plains Software Inc.	54
Hagenuk Telecom	12
Hurwitz Group Inc.	54
IBM Corp.	12, 26, 54
ITT Systems & Sciences Corp.	30
J.P. Morgan & Co. Inc.	54
Jupiter Communication LLC	12
Kaman Corp.	30
Kaman Sciences Corp.	30
KPMG Consulting	54
Logistix	54
Macy's	12
Merrill Lynch & Co. Inc.	12
Muhlenberg Regional Medical Center	62
NCR Corp.	12
Niche Systems Inc.	54
Oracle Corp.	30, 54
PeopleSoft Inc.	54
Pricer/Intactix North America	12
SAP AG	54
Sarnoff Corp.	44
Scala Inc.	54
Science Applications International Corp.	44
Sharp Corp.	44
Sharp Laboratories of America Inc.	44
SmithKline Beecham Pharmaceuticals Corp.	44
Solomon Software Inc.	54
SRI International	44
Standish Group International Inc., The	30
SunSystems Inc.	54

TRW Inc.	54
Wal-Mart Stores Inc.	12
Wireless Technology Research Group	12

Advertiser Index

*Denotes Section 2 Advertisers

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Acxiom Corp.	23*
Adante	21*
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American Power Conversion	65
Attachmate Corp.	19*
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Computer Associates Intl. Inc.	C4, C4*, 5, 16A, 17
Computer Museum	79
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Deloitte & Touche LLP	37
Dow Jones & Co.	5*
EDS Corp.	55
Ernst & Young LLP	35*
Exabyte Corp.	11*, 30
Exide Electronics	59
Filenet Corp.	7*
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Hewlett-Packard Co.	16*
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Intel Corp.	29
JD Edwards & Co.	39*
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LBMS Inc.	67
Lucent Technologies	71*, 75
MCI Communications Corp.	23
Microsoft Corp.	2, 34
MKS Inc.	25
Modis	47*
NCR Corp.	40
NeoMedia Technologies Inc.	33
Networld+Interop	C3*
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Viasoft Inc.	39
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CIO MAGAZINE

HONORING BUSINESS ACHIEVEMENT

ENTERPRISE

THROUGH THE INNOVATIVE USE OF

VALUE

INFORMATION TECHNOLOGY

AWARDS

APPLICATION DEADLINE: JUNE 15, 1998



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1999

CIO MAGAZINE

HONORING BUSINESS ACHIEVEMENT

ENTERPRISE

THROUGH THE INNOVATIVE USE OF

VALUE

INFORMATION TECHNOLOGY

AWARDSSM**CRITERIA**

The CIO Magazine Enterprise Value Awards honor technology-enabled business achievement arising out of effective business/IS collaboration.

Entries will be judged on the following criteria:

- **STRATEGIC IMPACT**
- **CUSTOMER IMPACT**
- **FINANCIAL IMPACT**
- **TECHNICAL EXCELLENCE**

We invite applicants to consider the broadest possible spectrum of enterprise value. The following list of IT-enabled benefits is not inclusive but rather is intended to help guide applicants' thinking:

STRATEGIC IMPACT

- Penetration of new markets
- Transformation of the terms of competition within the market
- Increased market share

CUSTOMER IMPACT

- Customers have more choices of products and services
- Customers receive better products and services at lower cost
- Transaction process is more rewarding/less time-consuming

FINANCIAL IMPACT

- Lower costs due to streamlined operations
- Increased profits
- Increased operational effectiveness

TECHNICAL EXCELLENCE

- Overall technical innovation
- Uniqueness of solution within the organization's industry
- Complexity of the problem or opportunity the system addresses

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SELECTION PROCESS

Finalists are chosen by a screening panel of CIO editors and independent consultants. Each finalist will be subject to an in-depth analysis of the nominated system (to be performed by CIO or its agents). This analysis, which may require a site visit, will be based on interviews with sponsoring executives and system users and will be designed to substantiate all claimed benefits. Winners are selected by an independent panel of judges—prominent IT executives from a variety of industries.

IMPORTANT DATES

Deadline: Applications must be received by **June 15, 1998**. Notification of winners will occur in October 1998.

ENTRY GUIDELINES

1. The system must have been fully operational prior to July 1, 1996.
2. Entrants must agree to be featured, along with their systems and organizations, in a CIO article.
3. Entries must be complete.
4. Entries must be on 8.5-by-11-inch paper, one side per sheet.
5. The application form may be reproduced.
6. Up to three entries from one company will be considered, but each entry must be submitted separately. Only one entry per company can win.
7. Entries must be made jointly by the IS executive sponsor AND by the business sponsor for whom the system delivers value.
8. IT vendors, public relations and advertising companies, consultants and other third parties may NOT apply on behalf of another company. They are encouraged to forward this form to the "owner" of the system or to contact CIO Communications to recommend that an application form be sent to the client.
9. All entries must be computer generated or typed; no handwritten entries will be accepted.
10. When feasible, an additional copy of the entry should be sent on a 3.5-inch disk. Electronic entries must be limited to word-processing and spreadsheet packages that are compatible with Microsoft Word and Microsoft Excel.

For more information, visit our Web site at www.cio.com/eva
or contact Lisa Kerber at 508 935-4449 or via e-mail at kerber@cio.com.

1 COMPANY/BUSINESS UNIT

Name of parent company

City, state where headquarters are located

Publicly or privately held?

Annual revenues

Industry

Name of business unit or organization

City, state where located

Number of employees at business unit

URL

2 ENTRANTS

A. Name of entering IS executive/system sponsor

Title

Name of division, department or unit

Address

City

State Zip

() ()

Telephone Fax

E-mail

B. Name of entering business-unit executive/sponsor

Title

Name of division, department or unit

Address

City

State Zip

() ()

Telephone Fax

E-mail

3 SUPPORTERS

Please list four people who are willing to be interviewed with regard to the system, its development, its use and the value returned. At least one should be a member of the technology team that developed the system and should have played a significant role. At least one should be a primary user from the sponsoring business unit. The other two may be from either organization or may represent suppliers, customers or others intimately familiar with the system.

A. Name

Title

() ()

Telephone Fax

E-mail

Reason for inclusion

B. Name

Title

() ()

Telephone Fax

E-mail

Reason for inclusion

C. Name

Title

() ()

Telephone Fax

E-mail

Reason for inclusion

D. Name

Title

() ()

Telephone Fax

E-mail

Reason for inclusion

DEADLINE: JUNE 15, 1998

Mail to: CIO Enterprise Value Awards • CIO Communications, Inc.
492 Old Connecticut Path • P.O. Box 9208 • Framingham, MA 01701-9208
Visit our Web site at www.cio.com/eva

For more-detailed information on the type of data the judges would like to see, including a model application, please visit our Web site at www.cio.com/eva.

4 THE NOMINATED ORGANIZATION

Please tell us about your organization (company, business unit, agency) in 500 words or less. Include information on

- When the organization was founded
- Mission statement
- Major products and services
- Markets served
- Your organization's standing within its industry
- Any other data you believe to be relevant in terms of general background

5 THE NOMINATED SYSTEM

Tell us about the nominated system and demonstrate its importance to the organization by completing the following sections. Please limit your material to one or two pages.

System Description: In one sentence or less, describe the system or IT initiative you are nominating (e.g., order-entry or sales-automation system; global intranet).

Date Deployed: Please indicate when the system was fully rolled out. If all users were not online by **July 1, 1996**, please detail what went live when.

Technical Profile: Briefly describe the technology of the nominated system, including its architecture; hardware, software and development tools used; and networking/communications hardware, software and services. Please include the names of all major vendors and products.

6 EVALUATION CRITERIA

Describe the primary business objectives of and value delivered by the IT investment. Please limit this section to five pages.

Statement of Value: List the three most important contributions the system has made to the business (these can demonstrate strategic, customer or financial impact as described in the "Defining Value" section on the first page of the application form). Please limit this answer to a few hundred words.

Strategic Impact: Define the ways in which the system has had strategic impact and describe in detail how the system delivers that impact. Make sure to include supporting data. For some examples of this, please refer to our Web site at www.cio.com/eva.

Customer Impact: Describe in detail how the system has benefited your customers. You may include examples from the organization's ultimate customers (consumers), the business users of the system, and suppliers or business partners affected by the system.

Financial Impact: Provide a detailed, one-page summary of the nominated system's investment costs (including all upfront development expenses and annual maintenance charges). Also provide details of the financial returns (including increased profits, reduced costs and indirect cost-avoidance). Please be specific about where the money is going/coming from and distinguish between actual and projected costs/returns. This data is required to make it past the first round of judging. If your company is selected as a finalist, you will be required at that time to fill out a standardized table detailing specific costs and returns.

Technical Excellence: Describe the degree of overall technical innovation of the solution (does it employ cutting-edge technology?); its uniqueness within your industry (is this an industry first or second, or is this a common solution?); and the complexity of the problem or opportunity it addresses. Please be as specific as possible and include supporting data.

7 OTHER CONSIDERATIONS

Scope and Impact: Identify the functions (e.g., customer service, manufacturing, sales) that were changed by the system, the nature of those changes and their impact on the business.

The Importance of IT: Explain the importance of the IT component to the overall business change. Could the results have been achieved without IT?

Collaboration: Describe how the business unit and IS organization worked together throughout the project, from concept to implementation. Who initiated the effort? What were the specific tasks fulfilled by the business unit? By the IS organization?

8 TRUTH OF INFORMATION RELEASE

The following release must be signed by both nominating executives if the application is to be considered. Unsigned releases will invalidate the entry.

I hereby state that the information provided is true and complete to the best of my knowledge and belief.

I authorize the release and use of, in connection with the CIO Enterprise Value Awards program, any and all materials furnished by me or others at the company contacted for this judging. I understand that information submitted on this application or subsequently gathered during the evaluation and judging process may be used in articles or any other type of publicity relating to the CIO Enterprise Value Awards program.

I also authorize the release and use of my name, my company's name and my likeness, including but not limited to any photographs and any recording of my voice or image that may be taken of me for CIO magazine. I agree that no compensation shall be due me or my company for such usage.

I recognize that failure to meet these conditions or to provide sufficient material that can be published can cause the application to be rejected at any point in the process at the sole discretion of the sponsors.

1. Signature of nominating IS executive

Date

2. Signature of nominating business executive

Date

9 OTHER EDITORIAL OPPORTUNITIES

If you are not selected as an award recipient, are you willing to be contacted for inclusion in other articles in CIO magazine?

Yes ☐ No ☐

How did you learn about the CIO Enterprise Value Awards program?

- | | |
|--|---|
| ☐ CIO magazine | ☐ Academician |
| ☐ cio.com Web site | ☐ Advertising agency |
| ☐ Consultant | ☐ IS staff member |
| ☐ Systems integrator | ☐ Other publications |
| ☐ PR agency | ☐ Vendor |
| ☐ Other (please identify) _____ | |

CHECKLIST

Have you filled out...?

- ☐ **Company/Business-Unit, Entrants and Supporters Information**

Have you included on separate pages...?

- ☐ **Nominated Organization**
☐ **Nominated System**
☐ **Evaluation Criteria**
☐ **Other Considerations**

Have both entrants signed and dated...?

- ☐ **Truth of Information/Release**

Have you checked off...?

- ☐ **Other Editorial Opportunities**
☐ **How you learned about the CIO Enterprise Value Awards program**

Ingredients For Winning:

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DO YOU QUALIFY FOR AN ENTERPRISE VALUE AWARD?

Four criteria are essential...

1. Strategic Impact
2. Customer Impact
3. Financial Impact
4. Technical Excellence

If your innovative solution meets the above criteria, please complete this Enterprise Value Awards application form and return it to us no later than June 15, 1998. CIO magazine will feature profiles of the winning organizations and the executives who have proved the positive and sustained impact of technology on enterprise value.

In February 1999, CIO and AT&T Solutions will host a special awards ceremony honoring the CIO Enterprise Value Award winners at the annual CIO Enterprise Value Retreat.

For more information, visit our Web site at www.cio.com/eva or contact Lisa Kerber at 508 935-4449 or via e-mail at kerber@cio.com.

CIO Enterprise Value Awards

TIME LINE

Applications Due:
June 15, 1998

Winners Announced:
October 1998

Awards Ceremony:
Jan. 31-Feb. 3, 1999
*at the CIO Enterprise Value Retreat,
Westin La Paloma, Tucson, Arizona*

PREVIOUS WINNERS

1998

Black & Veatch
New York City Department of Finance
Procter & Gamble
State Street Global Advisors
Tech Data Corp.
U.S. Environmental Protection Agency

1997

Bell Atlantic Corp.
The Chase Manhattan Corp.
Fidelity Investments
MacGregor Medical Association
Schlumberger Ltd.

1996

Brigham & Women's Hospital
Gensym Corp.
McDonnell Douglas Helicopter Systems
Rockwell Space Systems Division (SSD)
Telogy Inc.
United HealthCare Corp.

1995

APCOA Inc.
Commonwealth of Massachusetts
PCs Compleat Inc.
Hyatt Hotels & Resorts
Caterpillar Inc.
Kmart Corp.

1994

SynOptics Communications Inc. (now Bay Networks Inc.)
Complete Health Services Inc.
Los Angeles County Department of Public Social Services
AT&T Universal Card Services Corp.
Chicago Bureau of Parking
South Florida Water Management District

1993

The Perrier Group of America Inc.
New York City Transit Authority
Medical Center of Delaware
Texas Instruments
Lone Star Gas Co.
Travelers Managed Care and Employee Benefits Operations

CIO ENTERPRISE VALUE AWARDS

HONORING BUSINESS ACHIEVEMENT THROUGH THE
INNOVATIVE USE OF INFORMATION TECHNOLOGY

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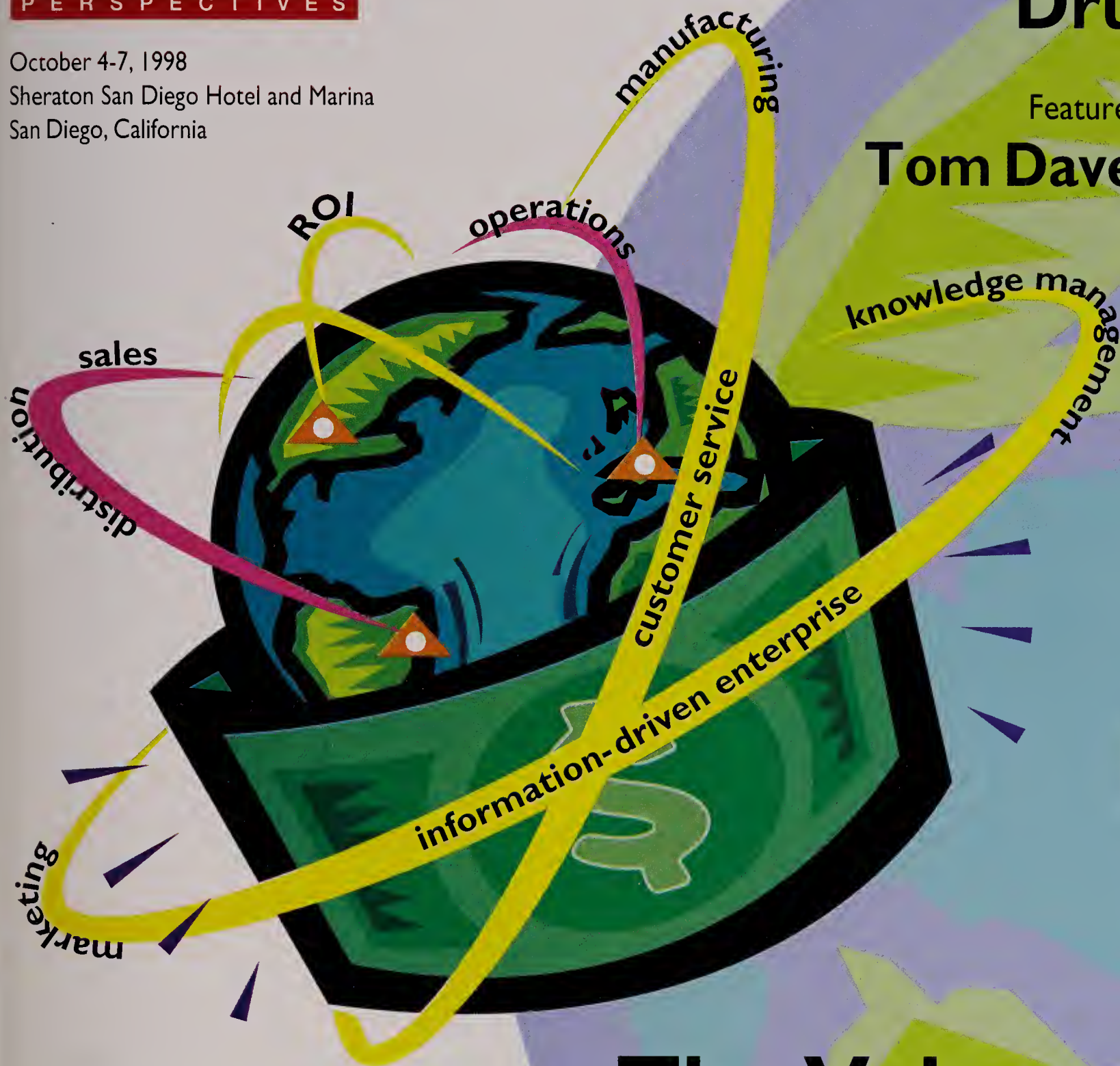
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The Value of Enterprise Information as Business Currency

Facts on Firewalls

ANALYSTS DESCRIBE A FIREWALL IN VARIOUS ways: a wall around your data fortress; a traffic cop watching the flow of vehicles with an eye toward pulling over the auto that breaks the rules; or a sentry posted outside a building, checking the contents of people's bags as they go in. All of these descriptions are accurate.

Is a firewall some kind of hardware? No, a firewall is several software components that can essentially sit anywhere you want. Typically, it stands guard where your corporate network meets the Internet. If it is set up properly, it will look at packets of data as they come in from the Internet or as they leave your company network for the global network. As it looks, it checks the data against defined policy tables to see if it should be allowed to pass. You can decide whether the firewall should look at just the source, destination or protocol, or whether it should look inside each packet of data and check its contents. Your firewall can be configured to block e-mail messages beyond a certain size or to prevent e-mail with certain types of attachments from coming in or leaving your network.

So firewalls act as a buffer from the outside world? That and more. Sometimes the enemy from within can be as deadly, and firewalls can be used to restrict access to certain databases. For example, what business does someone in sales have lurking in the human resources database? If your answer is "none at all," then maybe sales should not have access to human resources. In



other words, you can put the human resources database behind a firewall.

What does my company stand to lose if security is breached? In a word, plenty. Not only are we talking millions of dollars' worth of data that could be corrupted or stolen but also liability issues. Liability lawsuits—based on the argument, among others, that the company created a hostile work environment resulting from sexual innuendoes or dirty pictures being passed around on the Net—could run into millions of dollars.

How should I go about securing my company? You first need to assess with your CIO what you're trying to protect and its importance to your organization. Do you have an access policy in place? If so, is someone monitoring it? What process do you have to keep the policy and monitoring up-to-date? Remember that you can provide different levels of access to different types of data. Think of a safe deposit box in a bank. To get to it, you have to go into a secure vault, sign in and use your key—in conjunction with the bank's key—to get to your belongings. But do you need that level of firewall protection for all your data? Some types of data may be safe enough just being in the vault. Whatever you decide should be based on business managers' input because they know who should have access to what corporate assets.

Suruchi Mohan, a freelance writer in Los Altos, Calif., can be reached at smohan@compuserve.com.

Buzzwords

Content security: Any information that goes over the company network is the responsibility of the corporation. Management must make sure the content is not offensive and does not compromise the security of the company.

Packet-filtering firewall: Offering the bare minimum of security, this type of

firewall looks only at packets—the source and destination, but not the content—of data going over the network and checks them against a routing table before denying or permitting access.

Proxy firewall: This type of firewall offers security across networks by looking at content. Other security features, such as data encryption and authentication, can be added.

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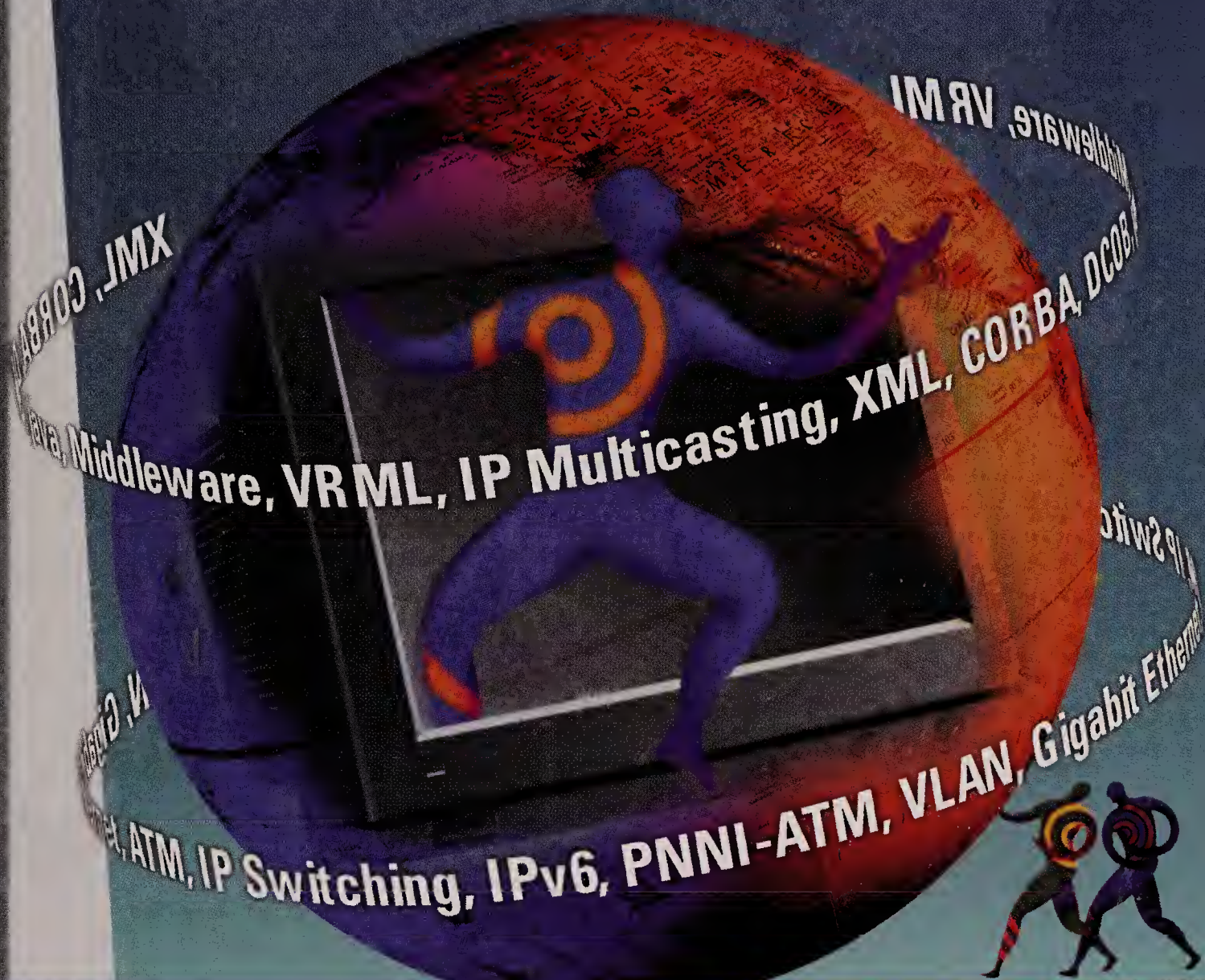
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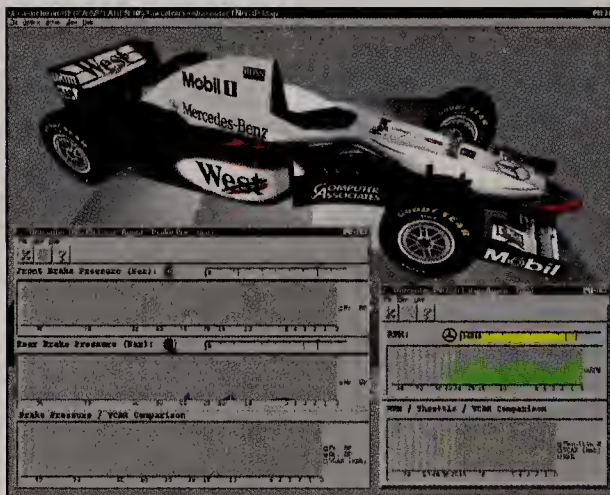
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